SOIL SURVEY OF
San Juan Area of Puerto Rico

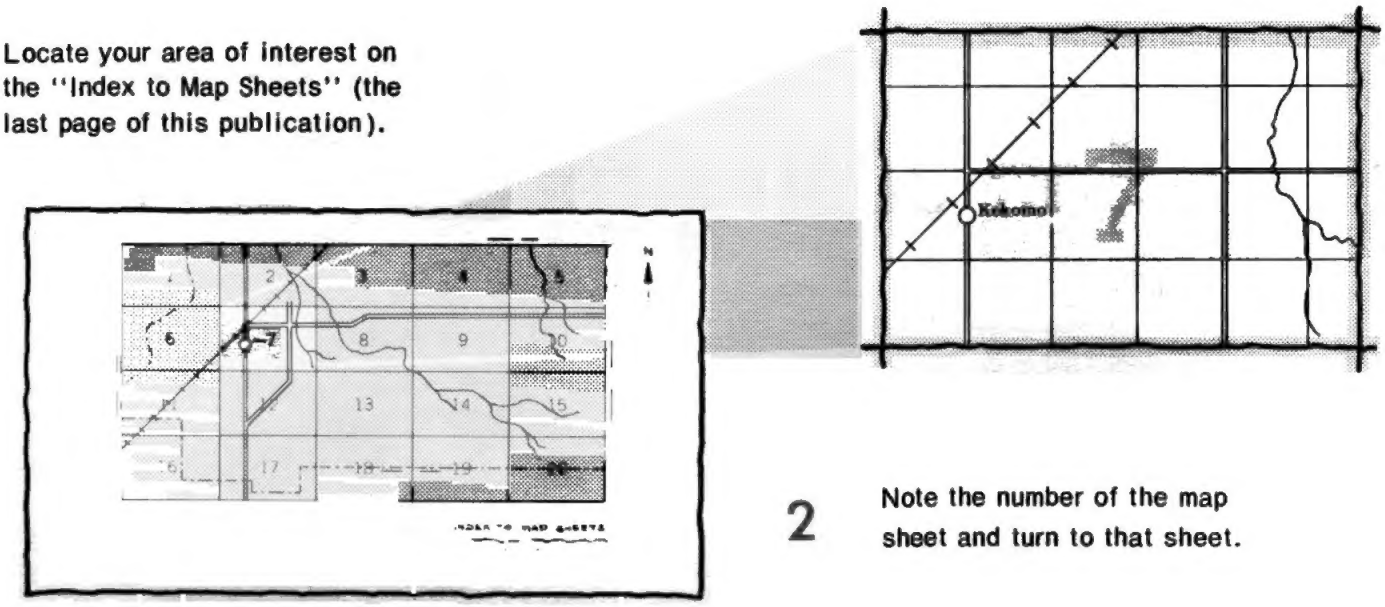
United States Department of Agriculture
Soil Conservation Service

In cooperation with

University of Puerto Rico
Agricultural Experiment Station

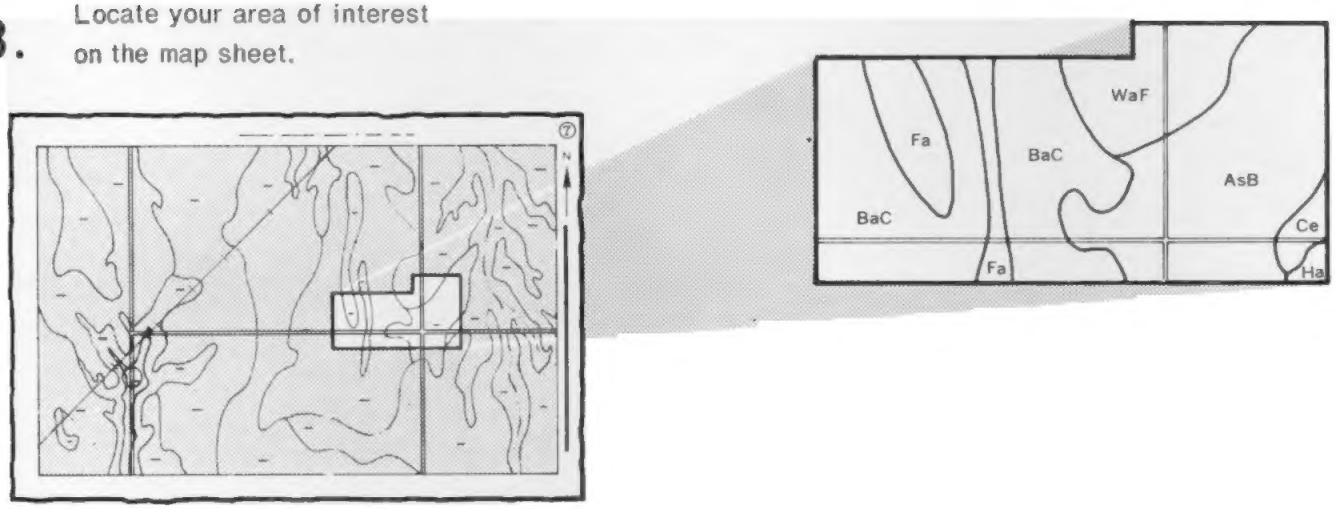
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

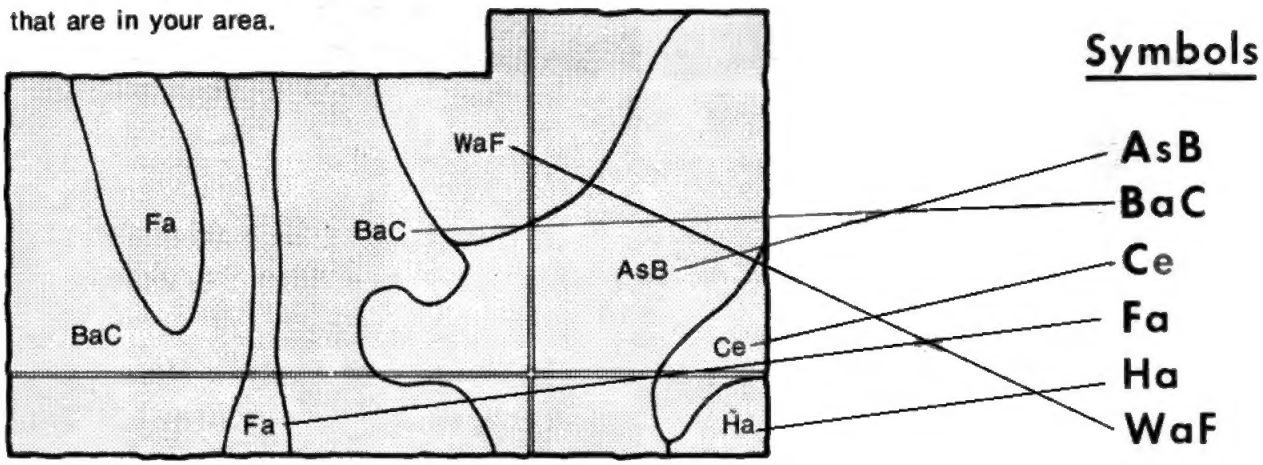


2 Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

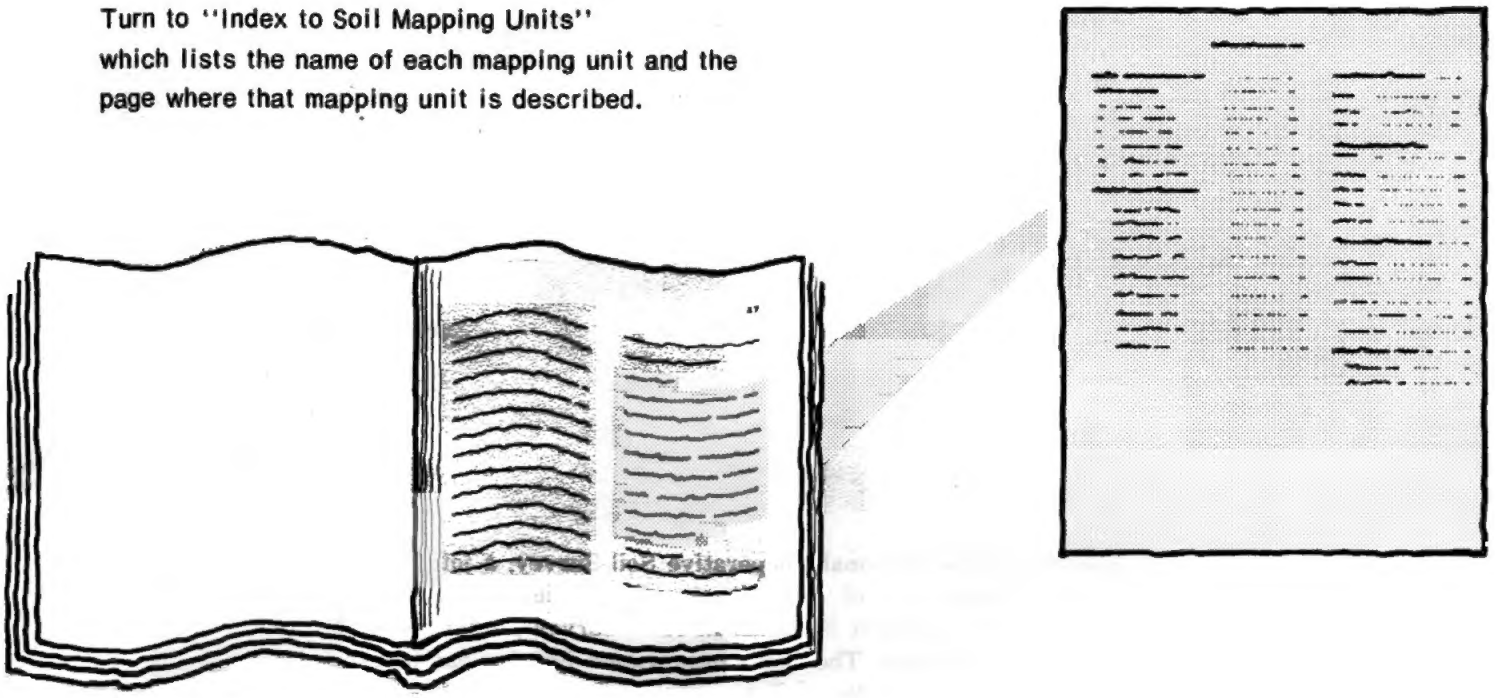


4 List the mapping unit symbols that are in your area.

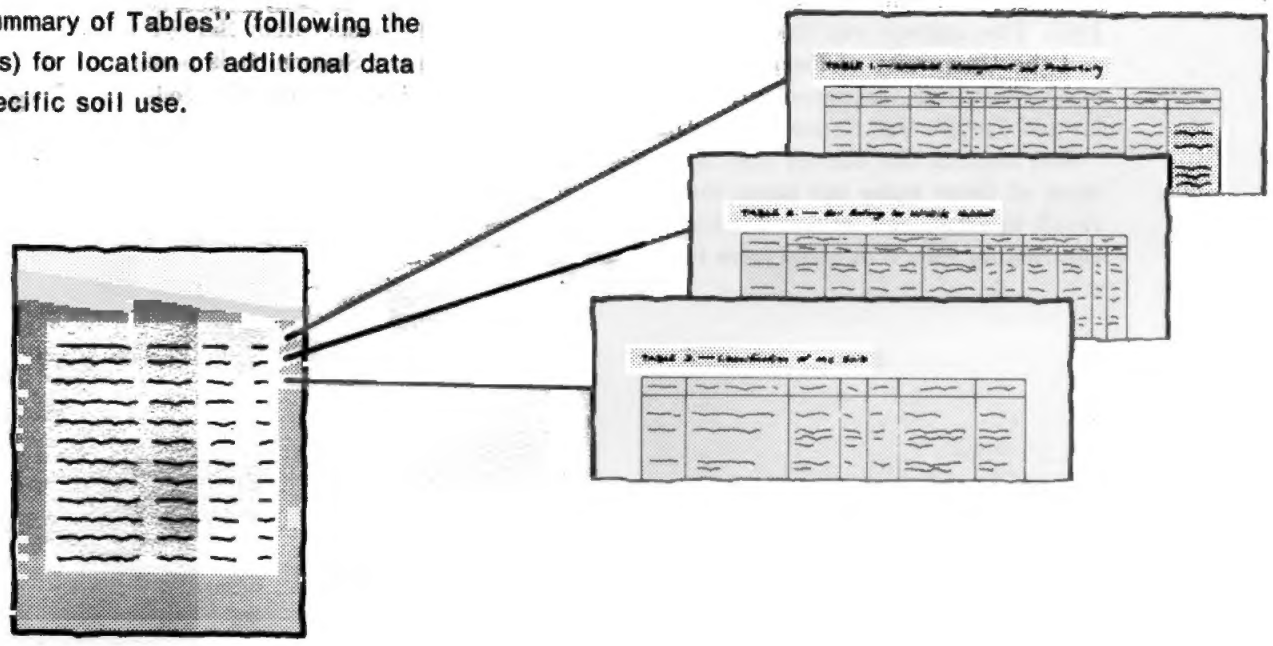


THIS SOIL SURVEY

Turn to "Index to Soil Mapping Units" which lists the name of each mapping unit and the page where that mapping unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in October 1972. Soil names and descriptions were approved in August 1973. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1976. This survey was made cooperatively by the Soil Conservation Service and the University of Puerto Rico Agricultural Experiment Station. It is part of the technical assistance furnished to the Cibuco, San Juan, Torito, Torrecillas and Turabo Soil Conservation Districts.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Contour plantings of bananas in the San Juan Area.

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Foreword

The Soil Survey of the San Juan Area contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

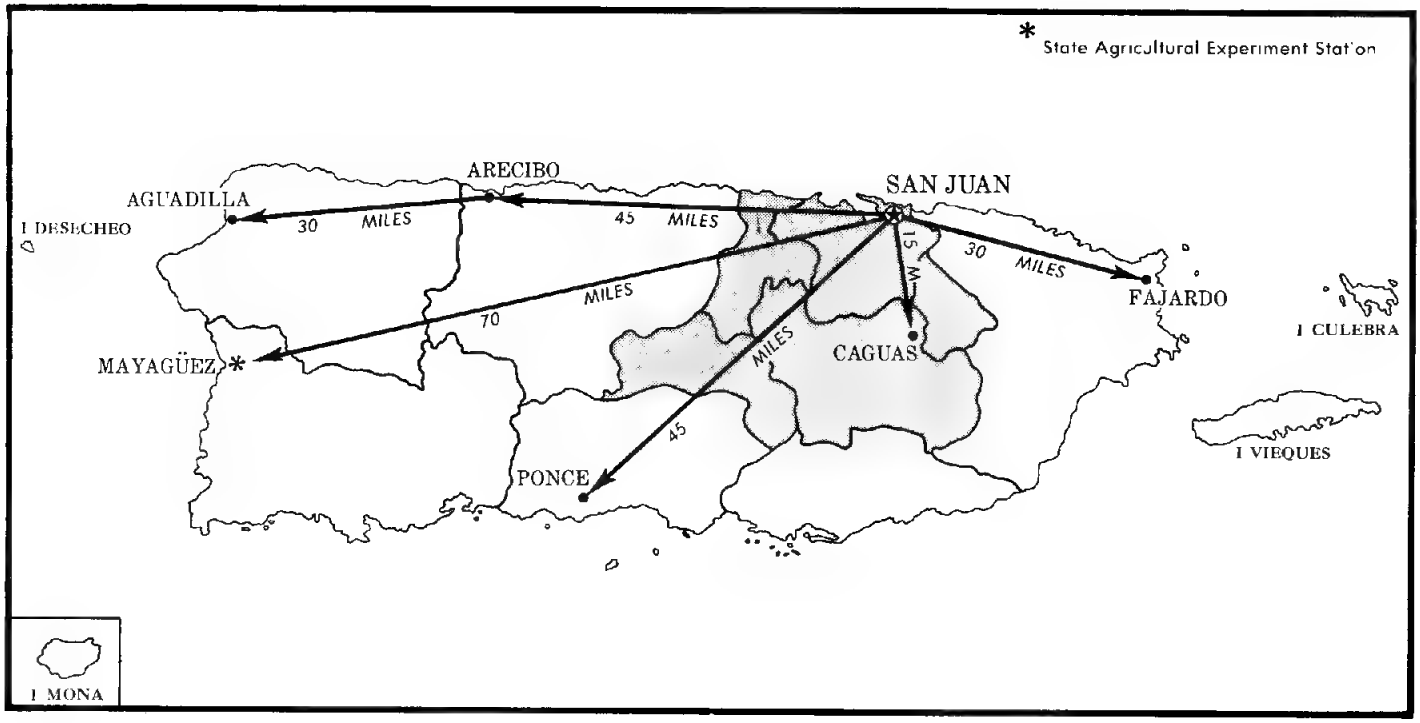
This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Angel Quintero
Director, Caribbean Area
Soil Conservation Service



Location of San Juan Area of Puerto Rico.

SOIL SURVEY OF SAN JUAN AREA OF PUERTO RICO

By Rafael A. Boccheciamp, Soil Conservation Service

Fieldwork by Rafael A. Boccheciamp, William Francia Rivera, Julio E. Trigo, G. Torres Ricci, Jose E. Brunet, and Luis H. Rivera, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the University of Puerto Rico, Agricultural Experiment Station

General nature of the area

The island of Puerto Rico is the smallest and farthest east of the four islands - Cuba, Jamaica, Hispaniola, and Puerto Rico - known as the Greater Antilles. It lies in the Torrid Zone. The north central coast of Puerto Rico is about 1,600 statute miles southeast of New York City, and the western part of the island is about 450 miles from the eastern point of Cuba. Ponce, on the south coast, is about 525 miles due north of Caracas, Venezuela.

The island was discovered by Christopher Columbus on his second voyage, November 19, 1493. The native inhabitants of the island, the friendly Taino Indians of the Arawak culture, lived in small villages, each ruled by a cacique, a chief. They grew food crops such as cassava and corn, and also tobacco and cotton. They also fished and hunted birds for their subsistence. They were clever at working stones, clay, and gold and adorned themselves with ornaments of these materials. The island was first settled in 1508 by Juan Ponce de Leon.

The San Juan Soil Survey Area is in northeast-central Puerto Rico (see facing page). It is bounded on the north by the Atlantic Ocean. San Juan, the capital of Puerto Rico, is in the northern part of the survey area. Mayaguez is 98 miles from San Juan. Ponce, the second largest city on the island, is 75 miles from the capital. The survey area covers an area of 447,279 acres. According to the census of 1970, the population totaled 1,172,609, of which 286,906 was rural and 885,703 urban. At that time there were 8,646 farms in the survey area.

The area consists of three major physiographic areas: the nearly level to sloping coastal plain, which is 10 percent of the area; the haystacks or limestone hills with their remarkable karst topography, which is about 4 percent; and the extensive igneous upland, which is 86 percent.

There are five soil conservation districts in the San Juan Soil Survey Area, namely: the Cibuco SCD, 80,101 acres, the municipalities of Corozal, Comerio, Naranjito, and Toa Alta; the San Juan SCD, 122,372 acres, the municipalities of Bayamon, Dorado, Toa Baja, Catano, Guaynabo, Rio Piedras, and Trujillo Alto; the Torito SCD, 74,533 acres, the municipalities of Cayey, Cidra, and Aguas Buenas; the Turabo SCD, 88,643 acres, the municipalities of Caguas, Gurabo, and San Lorenzo; and the Torrecillas SCD, 81,630 acres, the municipalities of Barranquitas, Aibonito, and Orocovis.

Farming is the principal enterprise of the area. Numerous industries, among which is the Consolidated Cigar Company, the largest cigar factory in the world, contribute to the welfare and economy of the island.

Improved pasture such as pangolagrass, stargrass, and Merker grass cover about 210,750 acres, or 47 percent of the area, according to the census of Agriculture of 1969. Most of the pastureland is used for raising beef and dairy cattle.

The principal cash and food crops of the area are plantains, taniers, yams, and tobacco. The total acreage is 89,353, or 20 percent of the area.

Woodland covers 72,239 acres, or 16 percent of the survey area.

Climate

In the San Juan Area of Puerto Rico the days are hot, except in January and February. The nights are warm all year. Winds from the Atlantic Ocean lower the afternoon temperatures on most days. Temperatures in the mountains of the interior are appreciably lower than elsewhere, but freezing temperatures are unknown anywhere in the area. Rainfall is abundant throughout the year in most of the area. The least falls in February and March. Except for the semiarid southernmost part, rainfall is heaviest in the mountains.

Tables 1 and 2 list data on temperature and precipitation for the survey area, as recorded at San Juan Airport for the period 1955 to 1974 and at Barranquitas, which is 2200 feet higher than San Juan, for the period 1963 to 1974.

In winter the average temperature at San Juan is 77 degrees F, and the average daily minimum temperature is 70. The lowest temperature on record, which occurred at

San Juan on March 3, 1957, is 60 degrees. In summer the average temperature is 82 degrees, and the average daily maximum temperature is 88. The highest recorded temperature, which occurred on June 21, 1972, is 96 degrees.

In winter the average temperature at Barranquitas is 69 degrees, and the average daily minimum temperature is 61. In summer the average temperature is 74 degrees, and the average daily maximum temperature is 82. The highest recorded temperature, which occurred on October 2, 1969, is 96 degrees.

Growing degree days, shown in tables 1 and 2, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (60 degrees F).

Of the total annual precipitation at San Juan, 31 inches, or 56 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 23 inches. The heaviest 1-day rainfall during the period of record was 5.01 inches at San Juan on August 6, 1955.

Of the total annual precipitation at Barranquitas, 28 inches, or 49 percent, usually falls in April through September. In 2 years out of 10, the rainfall during this period is less than 19 inches. The heaviest 1-day rainfall during the period of record at Barranquitas was 8.70 inches on October 9, 1970.

From June through November, an occasional tropical depression skirts or crosses the area and produces heavy rainfall that causes severe flooding. Thunderstorms number about 40 each year, 17 of which occur in summer. Every 10 to 20 years a hurricane causes wind damage and flooding.

The average relative humidity in midafternoon is about 65 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 60. The prevailing wind is from the northeast. Average windspeed is highest, 10 miles per hour, in March.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in areas nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for

general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The soils in the survey area vary widely in their potential for major land uses. Table 3 shows the extent of the map units shown on the general soil map and gives general ratings of the potential of each, in relation to the other map units, for major land uses. Soil properties that pose limitations to the use are indicated. The ratings of soil potential are based on the assumption that practices in common use in the survey area are being used to overcome soil limitations. These ratings reflect the ease of overcoming the soil limitations and the probability of soil problems persisting after such practices are used.

Each map unit is rated for *cultivated farm crops*, *specialty crops*, *woodland*, *urban uses*, and *recreation areas*. Cultivated farm crops are those grown extensively by farmers in the survey area. Specialty crops include vegetables, fruits, and nursery crops grown on limited acreage and generally requiring intensive management. Woodland refers to land that is producing either trees native to the area or introduced species. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas include campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas include those used for nature study and as wilderness.

Map unit descriptions

Soils formed in residuum from basic volcanic rocks

These map units are in the central and southern parts of the soil survey area. The soils formed mainly in clayey material weathered from basic volcanic rocks. They are mostly steep to very steep. A few are gently sloping to sloping. V-shaped drainageways dissect the entire area. Many of the soils in the humid area are planted to clean cultivated crops regardless of the steepness of slope and hazard of erosion. The Descalabrado unit, in the southern part of the survey area, is mostly brushy pasture. The semiarid climate, steepness of slope, and shallow depth to bedrock make it unsuited to cultivated crops.

1. Maricao-Los Guineos

Deep, steep to very steep, well drained and moderately well drained soils of the humid mountainous areas

This unit is in the southeastern part of the survey area. The soils formed in residuum weathered from basic volcanic rocks. They are steep to very steep. They are used for food crops, pasture, and forest. They receive moisture throughout the year and are not deficient in moisture needed for the common crops.

This unit occupies 10 percent of the total acreage. The landscape is mountainous and is strongly dissected by intermittent streams. Steep to very steep side slopes and ridges are common.

The Maricao soils are deep to hard rock, well drained, and clayey. They are on strongly dissected uplands where slope gradients are 20 to 60 percent. They occupy about 55 percent of the unit.

The Los Guineos soils are deep to hard rock, moderately well drained, and clayey. They are on side slopes having gradients of 20 to 60 percent. They occupy about 40 percent of the unit.

The remaining 5 percent of the unit is made up of the deep, well drained, clayey Humatas soils.

This unit in general has severe limitations for farming because of the slope and the erosion hazard. Complex conservation practices and good management are needed in order to produce crops. These soils are best suited to grasses and trees. Steep slopes and the erosion hazard make fieldwork costly and difficult.

2. Humatas-Naranjito-Consumo

Deep to moderately deep, moderately steep to very steep, well drained soils of the humid mountainous areas

This unit, the second largest, makes up 29 percent of the total acreage. It is in the mountainous section of the survey area. The landscape is one of gently sloping foot slopes to very steep side slopes and ridges that are dissected by intermittent streams. These soils formed in the residuum of weathered basic volcanic rocks and siltstone. They are used for food crops and pasture. They receive adequate moisture throughout the year for the crops commonly grown.

The Humatas soils are deep, well drained, and clayey. They are on mountainsides where slope gradients are 20 to 60 percent. They make up about 36 percent of the unit.

The Naranjito soils are moderately deep, 20 to 40 inches to hard consolidated volcanic rocks, and are well drained and clayey. They are on strongly dissected uplands where slope gradients are 12 to 60 percent. They make up about 29 percent of the unit.

The Consumo soils are deep but have very highly weathered rock at a depth of 14 to 24 inches. They are well drained, clayey soils on the side slopes of naturally dissected uplands where slope gradients are 20 to 60 percent. They occupy about 17 percent of the unit.

The remaining 18 percent consists of the deep, well drained, clayey Daguey, Aceitunas, and Rio Piedras soils and the somewhat poorly drained Lares soils.

This unit in general has severe limitations for cultivated crops because of the slope and the erosion hazard.

The less steep slopes are suitable for cultivation if complex soil conservation practices are applied and the soils are well managed. Liming and fertilizing are necessary for better crop yields. The use of machinery is not feasible on most of this unit. The slope is a severe limitation for buildings or other developments.

3. Mucara-Caguabo

Moderately deep to shallow, moderately steep to very steep, well drained soils of the humid mountainous areas

This unit, the largest, makes up about 39 percent of the total survey area. The landscape is mountainous and is highly dissected by intermittent streams. Narrow ridges are common. This unit is in the humid mountainous region of the survey area extending from the vicinity of Orocovis to San Lorenzo.

The Mucara soils are moderately deep, 20 to 40 inches to semiconsolidated rock, and are well drained and clayey. They are on side slopes of strongly dissected uplands where slope gradients are 12 to 60 percent. They make up about 58 percent of the unit.

The Caguabo soils are shallow to hard rock, well drained, and loamy. They are on side slopes and ridgetops where slope gradients are 20 to 60 percent. They make up about 37 percent of the unit. In some areas the surface of these soils is covered with stones.

The remaining 5 percent consists of the well drained, loamy Morado and Sabana soils and the moderately well drained, clayey Juncos soils. The Morado and Sabana soils occupy similar positions on the landscape as the Mucara and Caguabo soils. The Juncos soils, which are more gently sloping, occupy the side slopes and foot slopes of strongly dissected uplands.

This unit in general is not suitable for cultivation because of the slope, erosion hazard, rapid runoff, and depth to rock. It is suitable for pasture and woodland. A large acreage is in brush and brushy native pasture. Some areas have been cleared and planted to pangolagrass. Small patches are in food crops. Steep slopes, the erosion hazard, and the depth to rock are permanent limitations that preclude the use of these soils for clean cultivation. Fieldwork is difficult and costly. The soils have severe limitations for nonfarm uses such as dwellings, roads, recreational facilities, and other intensive developments.

4. Descalabrado

Shallow, very steep, well drained soils of the semiarid mountainous areas

This unit is in the southern part of the survey area. The soils formed in the residuum of weathered basic volcanic rocks. They do not receive enough rainfall throughout the year and are deficient in moisture needed for growing common cultivated crops. The topography is rugged and very steep. This unit makes up 1 percent of the total survey area.

The Descalabrado soils are shallow to volcanic rock and well drained. They are on side slopes where slope gradients are 40 to 60 percent. They make up 91 percent of the unit. The remaining 9 percent consists of boulders and the shallow, well drained, acid Guayama soils.

Because of the low rainfall of the area, most of the soils are in native guineagrass and brush. Clean tilled crops are not suited because of the slopes, depth to rock, and moisture deficiency. Most of the plant cover dies during long periods of drought.

Soils formed in residuum from intrusive igneous rocks

This unit is in the southeastern part of the survey area near the town of San Lorenzo. The soils formed mainly in the residuum of granitic rocks. Most are steep and very steep. The landscape is mountainous, with V-shaped drainageways dissecting the entire area and with narrow, knife-like ridges, gullies, and slips. Some of the soils are planted to clean cultivated food crops, but many are in native and improved pasture. Most soils in this unit have low potential for crops because of the steep slopes and shallow depth to the granitic rock.

5. Pandura-Lirios

Shallow to deep, moderately steep to very steep, well drained soils of the humid mountainous areas

This unit, one of the smaller, makes up 7 percent of the total acreage of the soil survey area. It is in the vicinity of San Lorenzo. The soils formed in the residuum of granitic rock that is part of the San Lorenzo Batholith. The landscape is mountainous and is highly dissected by numerous intermittent streams. Narrow ridges, gullies, and slip areas are common.

The Pandura soils are shallow to weathered granitic rocks, well drained, loamy, moderately steep to steep. They are on side slopes of the granitic uplands where slope gradients are 12 to 60 percent. They make up about 62 percent of the unit.

The Lirios soils are deep, but highly weathered granitic rock is at a depth of 20 to 34 inches. These are well drained, steep to very steep soils with a clayey subsoil. They are on side slopes and narrow ridgetops where slope gradients are 20 to 60 percent. They make up 26 percent of the unit.

The remaining 12 percent of the unit is made up of the deep, well drained, clayey Limones and Jagueyes soils and the somewhat poorly drained, clayey Cayagua soils. The Limones and Jagueyes soils are on side slopes and narrow ridgetops where slope gradients are 20 to 60 percent.

This unit in general has severe limitations for farming because of the slope, erosion hazard, and low fertility of the soils. It has been intensively cultivated for food crops. Some areas are in improved pasture. Others are in brush and brushy pasture.

Steep slopes and the erosion hazard are permanent limitations that preclude the use of these soils for clean cultivated crops. The slope is a severe limitation for non-

farm uses such as dwellings, septic tanks, recreational areas, and other intensive developments.

Soils formed in residuum from limestone

This unit is in the northwestern part of the survey area. The soils formed mainly in clayey materials weathered from limestone. Many are steep and very steep. Some are nearly level to sloping. The landscape has a karst topography, which is characterized by haystack hills, locally known as "mogotes;" sinkholes; and underground drainage. Most of the soils are in brushy forest. Others are in native and improved pasture. The soils have low potential for clean cultivated crops.

6. Tanama-Colinas-Soller

Shallow to moderately deep, moderately steep to very steep, well drained soils of the humid mountainous areas

This unit makes up 4 percent of the total acreage of the survey area. The landscape is one of karst topography characterized by the brush-covered "mogotes," or haystack hills. This unit is in the northwestern part of the survey area, between the northern coastal plains and the uplands. The soils of this unit are severely limited for farming because of the steep slopes and the shallow to moderate depth to limestone rock. Some have been cleared of brushy vegetation and planted to pangolagrass. A large part, however, is still in brush and brushy pasture.

The Tanama soils are shallow, are well drained, and have a clayey subsoil. They have slope gradients of 20 to 60 percent. They make up 39 percent of the unit.

The Colinas soils are moderately deep to mixed soft limestone, are well drained, and have a clayey subsoil. They have slope gradients of 12 to 60 percent. They make up 29 percent of the unit.

The Soller soils are shallow to hard fragmental limestone, are well drained, and have a thin clayey subsoil. They have slope gradients of 20 to 60 percent. They make up 28 percent of the unit.

The remaining 4 percent of the unit consists of the deep, well drained, clayey Juncal soils and areas of limestone rockland.

Soils formed in transported materials

Most of these units are in the northern part of the soil survey area. Some are in inner valleys in the central part. The soils formed mainly in clayey sediments of mixed origin and in organic materials. They are mainly nearly level to sloping. They are on the coastal plains, on flood plains, in inner valleys, and in low depressional and lagoonlike positions. Many are planted to clean cultivated crops to which they are well suited. Soils in the Martin Pena-Saladar-Hydraquents unit, however, are very poorly drained and are therefore limited for farming.

7. Almirante-Vega Alta-Matanzas

Deep, gently sloping to sloping, well drained soils on terraces and alluvial fans of the coastal plain

This unit occupies 3 percent of the total acreage. It consists of gently sloping to sloping soils on coastal plains, on terraces, and in valleys between the limestone hills. It is in the northern section of the survey area.

The Almirante soils are deep, well drained, and clayey. They are on coastal plains where slope gradients are 2 to 12 percent. They make up about 55 percent of the unit.

The Vega Alta soils are deep, well drained, and clayey. They are gently sloping to sloping. They are on coastal plains and terraces where slope gradients are 2 to 12 percent. They make up about 21 percent of the unit.

The Matanzas soils are deep, well drained, and clayey. They are on foot slopes and in small valleys between the limestone hills. They have slope gradients of 2 to 5 percent. They make up about 11 percent of the unit.

The remaining 13 percent of the unit is made up of the deep, gently sloping, well drained, clayey Bayamon and Torres soils. These soils are on coastal plain terraces and alluvial fans.

This unit is suited to farming. Most of it was used for sugarcane but is now in improved pasture such as pangolagrass and stargrass. The soils of this unit should be limed, fertilized, and worked at the proper moisture condition to prevent puddling. They receive adequate moisture throughout the year for the crops commonly grown. For nonfarm uses, they have only slight limitations.

8. Toa-Bajura-Coloso

Deep, nearly level, well drained to poorly drained soils on flood plains

This unit is in the northern part of the survey area. The soils formed in mixed sediments derived from miscellaneous volcanic rocks and deposited over nearly level river flood plains. They receive adequate moisture throughout the year for the cultivated crops commonly grown. Most of these soils were intensively cultivated for sugarcane. The trend now is toward improved pasture, such as pangolagrass and stargrass. This unit makes up 4 percent of the total acreage of the survey area.

The Toa soils are deep, are moderately well drained to well drained, are moderately permeable, and have a clayey subsoil. They make up 32 percent of the unit.

The Bajura soils are deep, are poorly drained, are slowly permeable, and have a clayey subsoil. They make up 27 percent of the unit.

The Coloso soils are deep, somewhat poorly drained, slowly permeable soils with a clayey subsoil. They make up 17 percent of the unit.

The remaining 24 percent of the unit consists of the nearly level, moderately deep, moderately permeable Estacion soils and the deep, well drained, sandy Reilly soils and areas of riverwash.

These soils have severe limitations for nonfarm uses such as dwellings, septic tanks, and roads because of poor drainage and the flood hazard.

9. Mabi-Rio Arriba

Deep, nearly level to sloping, moderately well drained to somewhat poorly drained soils on terraces, footslopes, and alluvial fans of inner valleys

This unit is in the east-central part of the survey area. The soils formed in fine textured sediments of mixed origin. They receive adequate moisture throughout the year for most crops.

This small unit makes up 2 percent of the total acreage of the survey area. Most of the soils were used for sugarcane production. The trend now is toward improved pasture, such as pangolagrass.

The mabi soils are deep, somewhat poorly drained, slowly permeable, clayey soils. They have slope gradients of 0 to 12 percent. They make up 54 percent of the unit.

The Rio Arriba soils are deep, moderately well drained, moderately slowly permeable soils with a clayey subsoil. They have slope gradients of 2 to 12 percent. They make up 41 percent of the unit.

The remaining 5 percent is the deep, poorly drained, clayey Montegrande soil.

The soils of this unit have severe limitations for nonfarm uses because of their clayey nature and high shrink-swell potential.

10. Martin Pena-Saladar-Hydraquents

Deep, nearly level, very poorly drained soils in low depressions and lagoons of the coastal plain

This unit occupies 1 percent of the total acreage of the survey area. The landscape consists of low-lying depressions filled with water most of the year. This unit is in the northwestern part of the coastal plain, in the vicinity of Dorado.

The Martin Pena soils are deep and very poorly drained. They have a thin surface layer of muck underlain by clayey material. They make up 51 percent of the unit.

The Saladar soils are deep, very poorly drained muck. They make up about 23 percent of the unit.

Hydraquents formed in variable materials in tidal marshes that are permanently saturated with brackish water. These soils have no sulfidic materials within 50 centimeters of the mineral surface. They make up 12 percent of the unit.

The remaining 14 percent of the unit is made up of the deep, excessively drained Catano and Durados soils. These soils occupy a nearly level area of the coastal plain in the northwestern part of the survey area.

These soils have severe limitations for farming because of very poor drainage. Complex drainage practices are needed if they are to be reclaimed. For nonfarm uses, they also have severe limitations because of very poor drainage and low bearing capacity. It is necessary to sink pilings and use other complex engineering practices.

The soils of this unit are in an area of intensive development, and most of this area is being reclaimed for dwellings.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Colinas clay loam is one of several phases within the Colinas series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes, soil associations, and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Urbanland-Mucara complex is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The ex-

tent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Made land is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions

AaB—Aceitunas clay, 2 to 5 percent slopes. This is a gently sloping, well drained soil on terraces and alluvial fans. Slopes are smooth and are 100 to 500 feet long. The areas range from 20 to 200 acres.

Typically the surface layer is dark brown friable clay about 8 inches thick. The subsoil, to a depth of 60 inches, is yellowish red clay. It is firm to a depth of 30 inches and is friable from 30 inches to a depth of 60 inches.

Included with this soil in mapping are some small areas of Rio Arriba and Lares soils. The surface layer of the Rio Arriba soils is brown clay and that of the Lares soils is dark brown clay. These soils make up 10 to 20 percent of the acreage.

Permeability and the available water capacity are moderate. Runoff is medium. This soil is medium in natural fertility and has a deep root zone. It is difficult to work because of the stickiness and plasticity of the clay. It should be tilled at the optimum moisture content to avoid puddling and the formation of large clods. Crops respond well to heavy applications of fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as sugarcane, plantains, and taniers. It is best suited, however, to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is moderately suited to most urban uses because of its clayey nature. If the soil is used as construction sites, temporary plant cover should be established quickly in denuded areas. Capability subclass IIe.

AaC—Aceitunas clay, 5 to 12 percent slopes. This is a sloping, well drained soil on terraces and alluvial fans. Slopes are smooth and are 100 to 800 feet long. The areas range from 10 to 200 acres.

Typically the surface layer is dark brown friable clay about 8 inches thick. The subsoil, to a depth of 60 inches, is yellowish red clay. It is firm to a depth of 30 inches and is friable from 30 inches to a depth of 60 inches.

Included with this soil in mapping are some small areas of Rio Arriba, Lares, and Via soils. The surface layer of the Rio Arriba soils is brown clay and that of the Lares soils is dark brown clay. The surface layer of the Via soils is dark brown clay loam. These soils make up 15 to 20 percent of the areas of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium. This soil is medium in natural fertility and has a deep root zone. It is difficult to work because of the stickiness and plasticity of the clay. It should be tilled at the optimum moisture content to avoid puddling and the formation of large clods. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as sugarcane, plantains, and taniers. It is suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is moderately suited to urban uses because of the slope and its clayey nature. If the soil is used as construction sites, temporary plant cover should be established quickly in denuded areas. Capability subclass IIIe.

AbD—Aibonito clay, 12 to 20 percent slopes. This is a moderately steep, well drained soil on ridgetops and side slopes of strongly dissected volcanic uplands. Slopes are 400 to 800 feet long. The areas range from 10 to 50 acres.

Typically the surface layer is dark grayish brown, friable clay about 7 inches thick. The subsoil is about 36 inches thick; it is strong brown clay mottled with red and yellowish brown. The substratum, beginning at a depth of 43 inches, is red, strong brown, and white, friable clay saprolite to a depth of 65 inches and silty clay saprolite from 65 to 110 inches.

Included with this soil in mapping are small areas of Humatas, Consumo, and Los Guineos soils. The surface layer of the Humatas soils is dark brown clay, that of the Consumo soils is reddish brown clay, and that of the Los Guineos soils is dark yellowish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium. The soil is medium in natu-

ral fertility and has a deep root zone. It is difficult to work because of slope and the stickiness and plasticity of the clay. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for such crops as plantains, taniers, and yams. It is suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, mahogany, kadam, mahoe, and eucalyptus trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations in the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is moderately steep and subject to landslides. If the soil is used for construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and a temporary plant cover established quickly in denuded areas. Capability subclass IVe.

AbE—Aibonito clay, 20 to 40 percent slopes. This is a steep, well drained soil on ridgetops and side slopes of strongly dissected uplands. Slopes are 400 to 1000 feet long. The areas range from 10 to 200 acres.

Typically the surface layer is dark grayish brown, friable clay about 7 inches thick. The subsoil is about 36 inches thick; it is strong brown clay mottled with red and yellowish brown. The substratum, beginning at a depth of 43 inches, is red, strong brown, and white, friable clay saprolite to a depth of 65 inches and silty clay saprolite from 65 to 110 inches.

Included with this soil in mapping are small areas of Humatas, Consumo, and Los Guineos soils. The surface layer of the Humatas soils is dark brown clay; that of the Consumo soils is reddish brown clay; and that of the Los Guineos is dark yellowish brown clay. These soils make up 15 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. This soil is medium in natural fertility, and it has a deep root zone. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for such crops as plantains, taniers, and yams. It is suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and eucalyptus trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

AmB—Almirante clay, 2 to 5 percent slopes. This is a gently sloping, well drained soil on coastal plains and in valleys between the limestone hills. Slopes are smooth and are 800 to 1500 feet long. The areas range from 20 to 600 acres.

Typically the surface layer is dark yellowish brown, friable clay about 7 inches thick. The subsoil is firm clay to a depth of 60 inches. From 7 to 34 inches, it is strong brown; from 34 to 46 inches, it is brownish yellow and dark red; and from 46 to 60 inches, it is variegated brownish yellow, dark red, and light gray.

Included with this soil in mapping are small areas of the Vega Alta, Matanzas, and Bayamon soils. The surface layer of the Vega Alta soils is dark yellowish brown clay loam, and that of the Matanzas and Bayamon soils is dark reddish brown clay. These soils make up 10 to 20 percent of the areas of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium. This soil is medium in natural fertility and has a deep root zone. It is difficult to work due to the stickiness and plasticity of the clay. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is a major concern of management.

This soil has been used for sugarcane. It is best suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is moderately limited for most urban uses because of its clayey nature. Capability subclass IIe.

AmC—Almirante clay, 5 to 12 percent slopes. This is a sloping, well drained soil on coastal plains and in valleys between the limestone hills. Slopes are smooth and are 400 to 1000 feet long. The areas range from 10 to 400 acres.

Typically the surface layer is dark yellowish brown, friable clay about 7 inches thick. The subsoil is firm clay to a depth of 60 inches. From 7 to 34 inches, it is strong brown; from 34 to 46 inches, it is brownish yellow and dark red; and from 46 to 60 inches, it is variegated brownish yellow, dark red, and light gray.

Included with this soil in mapping are small areas of Vega Alta, Matanzas, and Bayamon soils. The surface layer of the Vega Alta soils is dark yellowish brown clay loam; that of the Matanzas and Bayamon soils is dark reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium. This soil is medium in natural fertility and has a deep root zone. It is difficult to work due to stickiness and plasticity of the clay. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is a major concern of management.

This soil has been used for sugarcane. It is suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is moderately limited for most urban uses because of its clayey nature. Capability subclass IIIe.

Ba—Bajura clay. This is a nearly level, poorly drained soil on river flood plains. Slopes are smooth and are 500 to 2000 feet long. The areas range from 20 to 1000 acres.

Typically the surface layer is dark brown, firm clay about 5 inches thick. The subsoil, about 7 inches thick, is dark gray, firm clay mottled with yellowish brown, very dark gray, and dark brown. The substratum, from a depth of 12 inches to 31 inches, is gray and yellowish brown, firm clay mottled with greenish gray. From 31 inches to 60 inches, the substratum is greenish gray, firm clay mottled with brownish yellow and bluish gray.

Included with this soil in mapping are small areas of the Coloso soils. The surface layer of the Coloso soils is dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow and the available water capacity is high. This soil is difficult to work due to stickiness and plasticity of the clay and wetness. It is fertile and has a deep root zone. When properly drained and managed, it is suited to crops (fig. 1).

This soil has been used for sugarcane. It is suited to pangolagrass, stargrass, and paragrass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is limited for most urban uses because of drainage, flood hazard, and high shrink-swell potential. Capability subclass IIIw.

BmB—Bayamon clay, 2 to 5 percent slopes. This is a gently sloping, well drained soil on foot slopes and in small valleys between the limestone hills. Slopes are 500 to 1000 feet long. The areas range from 10 to 300 acres.

Typically the surface layer is dark reddish brown, friable clay about 8 inches thick. The subsoil, to a depth of 66 inches is weak red and red, firm to friable clay.

Included with this soil in mapping are small areas of Matanzas soils. The surface layer of the Matanzas soils is dark reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate in this soil. Runoff is medium, and the hazard of erosion is slight to moderate. This soil is difficult to work because of the stickiness and plasticity of the clay. It is medium in natural fertility and has a deep root zone. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion and maintaining natural fertility are the major concerns of management.

This soil has been used for sugarcane and pineapples. It is suited to pangolagrass, stargrass, and Merker grass (fig. 2).

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil has slight to moderate limitations for most urban uses. If the soil is used for construction sites, temporary plant cover should be established quickly in denuded areas. Capability subclass IIe.

CaE—Caguabo clay loam, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes and tops of strongly dissected uplands. Slopes are 500 to 1000 feet long. The areas range from 20 to 800 acres.

Typically the surface layer is dark grayish brown, friable clay loam about 4 inches thick. The next layer is brown, friable very gravelly clay loam about 6 inches thick. The substratum, beginning at a depth of 10 inches, is a mixture of weathered and partially weathered volcanic rocks. Consolidated rock is at a depth of 16 inches.

Included with this soil in mapping are small areas of Mucara, Naranjito, and Consumo soils and a few rocky hilltops. The surface layer of the Mucara soils is very dark grayish brown clay; that of the Naranjito soils is dark brown silty clay loam; and that of the Consumo soils is reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate in this soil, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and shallow. Hillside ditches and diversions are difficult to lay out, establish, and maintain. This soil is fertile but has a shallow root zone. Controlling erosion is the major concern of management.

This soil has been used for tobacco and food crops such as sweet potatoes, bananas, and coffee. It is best suited to pangolagrass and stargrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, eucalyptus, and mahogany trees. Production of Honduras pine is low, about 800 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep, shallow, and subject to landslides. If the soil is used as construction sites, development should be on the con-

tour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIs.

CaF—Caguabo clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes and mountaintops of strongly dissected uplands. Slopes are 400 to 800 feet long. The areas range from 20 to 2000 acres.

Typically the surface layer is dark grayish brown, friable clay loam about 4 inches thick. The next layer is about 5 inches thick; it is brown, friable very gravelly clay loam. The substratum, beginning at a depth of 10 inches, is a mixture of weathered and partially weathered volcanic rocks. Consolidated rock is at a depth of 16 inches.

Included with this soil in mapping are small areas of Mucara and Naranjito soils and a few spots that have many boulders and stones on the surface. The surface layer of the Mucara soils is very dark grayish brown clay, and that of the Naranjito soils is dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and shallow. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The soil is fertile but has a shallow root zone. Controlling erosion is the major concern of management.

This soil has been used for tobacco and food crops such as sweet potatoes, bananas, and coffee. It is best suited, however, to pangolagrass and stargrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and eucalyptus trees. Production of Honduras pine is low, about 700 to 800 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep, shallow, and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIs.

CbF—Caguabo-Rock outcrop complex, 40 to 60 percent slopes. This complex consists of very steep, well drained soils and Rock outcrop on side slopes and narrow ridges. The areas range from 10 to 500 acres. The complex is about 60 percent Caguabo clay loam and 40 percent Rock outcrop and other minor soils. Caguabo and Rock outcrop form such an intricate pattern that they were not separated in mapping.

In a representative profile of Caguabo clay loam the surface layer is about 3 inches thick. The next layer, about 5 inches thick, is brown, friable very gravelly clay loam. It is underlain by a mixture of weathered and partially weathered volcanic rocks. Volcanic bedrock is at a depth of 10 to 20 inches.

Included with this soil complex in mapping are spots of deeper soils that formed between the rock outcrops. Also included are some areas of severely eroded Caguabo soils that have a thin surface layer of brown to dark grayish brown clay loam. These soils are on ridgetops.

Permeability is moderate in the Caguabo soil, and the available water capacity is low. The root zone is shallow. Tilth is fair to poor. Surface runoff is very rapid. In unlimed areas the soil is slightly acid.

The vegetation is shrubs, brush, and grass. This complex is not suited to cultivated crops. The potential for pasture is low. The Caguabo soil is suited to Honduras pine and eucalyptus trees. Production of Honduras pine is low, about 700 board feet per acre per year. The hazard of erosion and the limitations on the use of equipment are moderate. Logging roads, skid trails, and machine plantings should be on the contour to help control erosion. The use of equipment is restricted mainly by the very steep slopes and the many rock outcrops.

This complex is poorly suited to most urban uses, mainly because of the very steep slopes and shallow depth to the volcanic rock, which is at a depth of 10 to 20 inches. Most of the areas are subject to slides. Erosion is a severe hazard in areas not protected by vegetative cover. In areas that are used as construction sites, development should be on the contour. Removal of vegetative cover should be held to a minimum, and plant cover established quickly on denuded areas. Capability subclass VIIIs.

Ce—Candelero loam. This is a gently sloping, somewhat poorly drained soil on terraces, alluvial fans, and foot slopes. Slopes are undulating and are 100 to 800 feet long. The areas range from 30 to 100 acres.

Typically the surface layer is dark grayish brown loam about 6 inches thick. The subsoil from 6 inches to a depth of 35 is mainly dark brown, dark gray, and very dark gray, firm sandy clay loam mottled with yellowish brown, greenish gray, and brownish yellow. From 35 inches to a depth of 60 inches, the subsoil is brownish yellow and yellowish brown, firm sandy clay mottled with gray, greenish gray, and yellowish red.

Included with this soil in mapping are small areas of Cayagua soils. The surface layer of the Cayagua soils is dark grayish brown sandy loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is medium. This soil is difficult to work due to wetness and the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, Merker grass, and paragrass.

This soil is limited for most urban uses because of wetness, flood hazard, and its clayey nature. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

ClC—Catalina clay, 4 to 12 percent slopes. This is a sloping, well drained soil on side slopes and hilltops of the humid uplands. Slopes are 300 to 400 feet long. The areas range from 10 to 150 acres.

Typically the surface layer is dark reddish brown, friable clay about 6 inches thick. The subsoil layers from 6 inches to a depth of 84 inches are reddish brown and dark reddish brown firm clay. From 84 to 99 inches, the subsoil is variegated dusky red, dark reddish brown, and strong brown clay.

Included with this soil in mapping are small areas of Humatas, Daguey, and Consumo soils. The surface layer of the Humatas and Daguey soils is dark brown clay, and that of the Consumo soils is reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for plantains, yams, taniers, and coffee. It is suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, kadam, Eucalyptus robusta, and mahoe trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses due to slope, its clayey nature, and seepage. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

Cn—Catano loamy sand. This is a nearly level, excessively drained soil on narrow strips of the coastal plain. The areas range from 20 to 200 acres.

Typically the surface layer of this soil is very dark grayish brown loamy sand about 7 inches thick. The next layer is about 16 inches thick; it is dark brown, loose sand. The substratum, beginning at a depth of 23 inches, is dark grayish brown, loose sand.

Included with this soil in mapping are small areas of Durados soils. The surface layer of the Durados soils is very dark grayish brown sandy loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is rapid, and the available water capacity is low. Runoff is very slow. This soil is easily worked. The root zone is deep, but natural fertility is low. The soil is very limited for farming.

This soil has been used for growing coconuts. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is suited to most urban uses. Capability subclass VIs.

Co—Cayagua sandy loam. This is a sloping, poorly drained soil on alluvial fans. Slopes are 200 to 800 feet long. The areas range from 50 to 300 acres.

Typically the surface layer is dark grayish brown, friable sandy loam about 8 inches thick. The subsoil is about 24 inches thick; it is yellowish brown and light olive gray, firm clay mottled with red, yellowish red, strong brown, and gray. The substratum, beginning at a depth of 32 inches, is yellowish brown, white, and gray, friable, sandy clay loam saprolite.

Included with this soil in mapping are some areas of Candelero soils. The surface layer of the Candelero soils is dark grayish brown loam. These soils make up about 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of wetness. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, paragrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of wetness, seepage, and slope. If the soil is used as construction sites, development should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

CrD2—Colinas clay loam, 12 to 20 percent slopes, eroded. This is a moderately steep, well drained soil on ridgetops and side slopes of low rolling hills. Slopes are convex and are 200 to 500 feet long. The areas range from 10 to 300 acres. This soil has lost much of its original surface layer through erosion.

Typically the surface layer is dark brown, friable clay loam about 11 inches thick. The subsoil is about 15 inches thick; it is brownish yellow, friable clay loam. The substratum, beginning at a depth of 26 inches, is pale yellow, very friable, soft limestone that crushes to silty clay loam. From 48 to 52 inches, the substratum is yellow and white, soft limestone.

Included with this soil in mapping are small areas of Soller and Tanama soils. The surface layer of the Soller soils is very dark grayish brown clay loam; that of the

Tanama soils is dark reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is moderately steep and because of the stickiness and plasticity of the surface layer. The root zone is moderately deep. Natural fertility is low. Controlling erosion is the major concern of management.

This soil has been used for sugarcane. It is suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, mahoe, and teak trees. Production of Honduras mahogany is very low, about 450 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is moderately steep. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

CrE2—Colinas clay loam, 20 to 40 percent slopes, eroded. This is a steep, well drained soil on ridgetops and side slopes of low hills. Slopes are convex and are 100 to 300 feet long. The areas range from 20 to 400 acres. This soil has lost much of its original surface layer through erosion.

Typically the surface layer is dark brown, friable clay loam about 11 inches thick. The subsoil is about 15 inches thick; it is brownish yellow, friable clay loam. The substratum, beginning at a depth of 26 inches, is pale yellow, very friable, soft limestone that crushes to silty clay loam. From 48 to 52 inches, the substratum is yellow and white soft limestone.

Included with this soil in mapping are some areas of Soller and Tanama soils. The surface layer of the Soller soils is very dark grayish brown clay loam, and that of the Tanama soils is dark reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the surface layer. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. Natural fertility is low. Controlling erosion is the major concern of management.

This soil has been used for sugarcane. It is suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing are chief management needs.

This soil is suited to Honduras mahogany. Production of Honduras mahogany is very low, about 350 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

CrF2—Colinas clay loam, 40 to 60 percent slopes, eroded. This is a very steep, well drained soil on ridgetops and side slopes of hills. Slopes are convex and are 100 to 400 feet long. The areas range from 50 to 300 acres. This soil has lost much of its original surface layer through erosion. A few shallow to deep gullies have formed.

Typically the surface layer is dark brown, friable clay loam about 11 inches thick. The subsoil is about 15 inches thick; it is brownish yellow, friable clay loam. The substratum, beginning at a depth of 26 inches, is pale yellow, very friable, soft limestone that crushes to silty clay loam. From 48 to 52 inches, the substratum is yellow and white soft limestone.

Included with this soil in mapping are some areas of Soller and Tanama soils. The surface layer of the Soller soils is very dark grayish brown clay loam, and that of the Tanama soils is dark reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the surface layer. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. Natural fertility is low. Controlling erosion is the major concern of management.

This soil has been used for sugarcane. It is suited to pangolagrass.

Proper stocking rates and deferred grazing are chief management needs.

This soil is limited for most urban uses because it is very steep and is subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

Cs—Coloso silty clay loam. This is a nearly level, somewhat poorly drained soil on river flood plains. Slopes are smooth and 200 to 1000 feet long. The areas range from 100 to 600 acres.

Typically the surface layer is dark brown, friable silty clay loam about 7 inches thick. The underlying material from 7 to 16 inches is dark brown and dark yellowish brown, friable silty clay loam, from 16 to 32 inches is dark grayish brown and light gray silty clay loam mottled with dark yellowish brown, and from 32 to 70 inches is greenish gray silty clay mottled with yellowish red and yellowish brown.

Included with this soil in mapping are small areas of Toa and Bajura soils. The surface layer of the Toa soils is dark brown silty clay loam, and that of the Bajura soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the wetness and the stickiness and plasticity of the surface layer. The root zone is deep. This soil is fertile. Crops respond well to heavy applications of fertilizers.

This soil has been used for sugarcane (fig. 3). It is suited to pangolagrass, stargrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is limited for most urban uses because it is somewhat poorly drained, too clayey, and subject to overflow. Capability subclass IIw.

CuE—Consumo clay, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes of maturely dissected humid uplands. Slopes are irregular and are 200 to 1000 feet long. The areas range from 100 to 800 acres. This soil has lost much of its original surface layer through erosion. A few shallow to deep gullies have formed.

Typically the surface layer is reddish brown friable clay about 10 inches thick. The subsoil is about 10 inches thick; it is yellowish red, friable clay. The substratum, beginning at a depth of 20 inches, is red, brownish yellow, and yellowish red, very friable, silty clay loam saprolite.

Included with this soil in mapping are spots of Humatas, Naranjito, and Mucara soils. The surface layer of the Humatas soils is dark brown clay, and that of the Naranjito soils is brown to dark brown silty clay loam. The surface layer of the Mucara soils is very dark grayish brown clay. These included soils make up about 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management. This soil has been used for crops such as coffee. It is suited to pangolagrass and to molasses grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

CuF—Consumo clay, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes of maturely dissected humid uplands. Slopes are irregular and are 200 to 800 feet long. The areas range from 100 to 1000 acres. This soil has lost much of its original surface layer through erosion. A few shallow to deep gullies have formed.

Typically the surface layer is reddish brown friable clay about 10 inches thick. The subsoil is about 10 inches thick; it is yellowish red, friable clay. The substratum, beginning at a depth of 20 inches, is red, brownish yellow, and yellowish red, very friable, silty clay loam saprolite.

Included with this soil in mapping are spots of Humatas, Naranjito, and Mucara soils. The surface layer of the Humatas soils is dark brown clay, and that of the Naranjito soils is brown to dark brown silty clay loam. The surface layer of the Mucara soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as coffee. It is suited to pangolagrass and to molasses grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and is subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

CzC—Corozal clay, 5 to 12 percent slopes. This is a sloping, somewhat poorly drained soil on interfluves of strongly dissected low volcanic hills. Slopes are 200 to 400 feet long. The areas range from 20 to 100 acres.

Typically the surface layer is dark reddish brown, firm clay about 7 inches thick. The subsoil is about 33 inches thick; it is mostly red, firm clay. The substratum, beginning at a depth of 40 inches, is yellowish red, light gray, and strong brown, friable, clay loam saprolite.

Included with this soil in mapping are small areas of Consumo, Daguey, and Humatas soils. The surface layer of the Consumo soils is reddish brown clay, and that of the Daguey and Humatas soils is dark brown clay. These soils make up 10 to 20 percent of the area of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is medium, and erosion is a hazard. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as taniers and plantains. It is suited to pangolagrass, Merker grass, and improved bermudagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses due to its clayey nature and wetness. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

DaC—Daguey clay, 2 to 12 percent slopes. This is a gently sloping to sloping soil on stable side slopes, ridgetops, and foot slopes of the humid volcanic uplands. Slopes are 200 to 800 feet long. The areas range from 20 to 200 acres.

Typically the surface layer is dark brown firm clay about 10 inches thick. The subsoil is about 62 inches thick; it is yellowish red and red, firm clay. The substratum, beginning at a depth of 72 inches, is yellowish red, strong brown, and reddish yellow, friable, silty clay loam saprolite.

Included with this soil in mapping are small areas of Humatas and Catalina soils. The surface layer of the Humatas soils is dark brown clay; that of the Catalina soils is dark reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate in this soil. Runoff is medium, and erosion is a hazard. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as plantains, yams, taniers, and coffee. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, kadam, and mahoe trees. Production of Honduras pine is moderate about 1300 board feet per acre per year. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

Slope is a moderate limitation for most urban uses. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

DaD—Daguey clay, 12 to 20 percent slopes. This is a moderately steep, well drained soil on stable side slopes, ridgetops, and foot slopes of the humid volcanic uplands. Slopes are 100 to 500 feet long. The areas range from 20 to 200 acres.

Typically the surface layer is brown, firm clay about 10 inches thick. The subsoil is about 62 inches thick; it is yellowish red and red, firm clay. The substratum, beginning at a depth of 72 inches, is yellowish red, friable silty clay loam saprolite mottled with strong brown and reddish yellow.

Included with this soil in mapping are small areas of Humatas and Catalina soils. The surface layer of the Humatas soils is dark brown clay. That of the Catalina soils is dark reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. This soil is difficult to work because it is moderately steep (fig. 4) and because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for plantains, yams, taniers, and coffee. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta. Production of Honduras pine is moderate, about 1300 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush

removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

DeF—Descalabrado clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes and tops of strongly dissected uplands. Slopes are 200 to 1000 feet long. The areas range from 100 to 1000 acres.

Typically the surface layer is very dark grayish brown, friable clay loam about 5 inches thick. The subsoil is about 6 inches thick; it is dark brown, firm gravelly clay. The substratum, beginning at a depth of 11 inches, is dark yellowish brown and olive, friable gravelly sandy clay loam. Hard rock is at a depth of 17 inches.

Included with this soil in mapping are a few spots of Descalabrado-Rock outcrop complex and Guayama soils. The surface layer of the Guayama soils is dark reddish brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. This soil is difficult to work because it is steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. This soil is fertile, but has a shallow root zone. It is not suited to cultivated crops because it is in areas of low rainfall. The vegetation is brush and brushy pasture.

This soil is suited to Honduras pine. Production is very low, less than 800 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIs.

DgF—Descalabrado-Rock outcrop complex, 40 to 60 percent slopes. This complex consists of very steep, well drained soils and Rock outcrop on strongly dissected slopes. The areas range from 100 to 500 acres. The complex is 70 percent Descalabrado clay loam and 30 percent Rock outcrop and other minor soils.

In a representative profile of Descalabrado clay loam the surface layer is very dark grayish brown clay loam about 5 inches thick. The subsoil, about 6 inches thick, is dark brown, firm gravelly sandy clay loam. The substratum, beginning at a depth of 11 inches, is dark yellowish brown and olive, friable gravelly sandy clay loam. Hard consolidated volcanic rock is at a depth of 17 inches.

Rock outcrop consists of exposed bedrock occurring in such an intricate pattern with the Descalabrado soils that it was impractical to separate them in mapping.

Included with this soil complex in mapping are spots of Guayama and other miscellaneous soils with varying soil properties.

Permeability is moderate in the Descalabrado soil, and the available water capacity is low. Runoff is rapid. Natural fertility is high, and organic matter content is moderate. Reaction is neutral. The root zone is shallow.

The vegetation is brush and brushy pasture. This complex is not suited to cultivated crops. The best potential is for wildlife habitat. Potential for production of Honduras pine is very low, less than 800 board feet per acre per year.

The hazard of erosion and the limitations on the use of equipment are major concerns of management. Plant competition is severe for Honduras pine.

This complex has severe limitations for most urban uses because it is very steep. Capability subclass VIIs.

Dm—Dique loam. This is a nearly level, well drained soil on river flood plains. Slopes are smooth and are 50 to 300 feet long. The areas range from 5 to 100 acres.

Typically the surface layer is dark brown, friable loam about 6 inches thick. The subsoil is about 30 inches thick; it is dark brown and dark yellowish brown, friable loam. The substratum, beginning at a depth of 36 inches, is dark yellowish brown, friable loam.

Included with this soil in mapping are small areas of Toa soils. The surface layer of the Toa soils is dark brown silty clay loam.

Permeability and the available water capacity are moderate. Runoff is medium. This soil is easily worked. The root zone is deep. Natural fertility is high. Crops respond well to fertilizer.

This soil has been used for sugarcane (fig. 5). It is suited to pangolagrass, Merker grass, and improved bermudagrass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is limited for most urban uses because of the flood hazard. Capability class I.

Dr—Durados sandy loam. This is a nearly level, excessively drained soil on coastal plains. Slopes are smooth and are 50 to 100 feet long. The areas range from 20 to 100 acres.

Typically the surface layer is very dark grayish brown, very friable sandy loam about 14 inches thick. The layer from 14 to 23 inches is very dark grayish brown, loose loamy sand. Below a depth of 23 inches is loose sand of mixed colors and some thick layers of cemented sand.

Included with this soil in mapping are some areas of Catano soils and coastal beaches. The surface layer of Catano soils is very dark grayish brown loamy sand. Catano soils and coastal beaches make up 10 to 20 percent of this mapping unit.

Permeability is rapid, and the available water capacity is low. Runoff is very slow. This soil is easily worked. The root zone is deep. Natural fertility is low.

This soil has been used for coconuts. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

This soil is limited for most urban uses because of the flood hazard. Capability subclass VIs.

Es—Estacion silty clay loam. This is a nearly level, well drained soil on river flood plains. Slopes are smooth and are 100 to 400 feet long. The areas range from 10 to 200 acres.

Typically the surface layer is dark brown, friable silty clay loam about 8 inches thick. The layer from 8 to 20 inches is very dark grayish brown, friable gravelly clay loam. Below 20 inches is dark brown, loose gravelly sand.

Included with this soil in mapping are small areas of Reilly, Dique, and Toa soils. The surface layer of the Reilly soils is dark brown sandy loam, that of the Toa soils is dark brown silty clay loam, and that of the Dique soils is dark brown loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is slow. This soil is easily worked. The root zone is moderately deep. Natural fertility is high. Crops respond well to fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, Merker grass, and improved bermudagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of the flood hazard. Capability subclass IIIs.

GuF—Guayama clay loam, 20 to 60 percent slopes. This is a steep to very steep, well drained soil on side slopes and narrow ridgetops of dissected volcanic uplands. Slopes are irregular and are 100 to 800 feet long. The areas range from 50 to 300 acres.

Typically the surface layer is dark reddish brown, friable clay loam about 4 inches thick. The subsoil is about 8 inches thick; it is red, friable gravelly clay. The substratum, beginning at a depth of 12 inches, is red, friable gravelly silty clay loam. Consolidated volcanic rock is at a depth of 20 inches.

Included with this soil in mapping are small areas of Rock outcrop and Descalabrado soils. The surface layer of the Descalabrado soils is very dark grayish brown clay loam. Rock outcrop consists of exposed bedrock and thin patches of soil over rock. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. This soil is difficult to work because it is steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is shallow. Natural fertility is low. Controlling erosion is the major concern of management.

This soil has been used for pasture. It is suited to guineagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine. Production is very low, less than 800 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep to very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIs.

Hm—Humacao loam. This is a nearly level, well drained soil on terraces. Slopes are smooth and are about 50 to 200 feet long. The areas range from 10 to 100 acres.

Typically the surface layer is dark brown, friable loam about 8 inches thick. The subsoil is about 7 inches thick; it is dark yellowish brown, friable sandy clay loam. The substratum, beginning at a depth of 15 inches, is brown and strong brown, friable clay loam and reddish yellow, very friable sandy clay loam.

Included with this soil in mapping are some spots of Candelero soils. The surface layer of the Candelero soils is dark grayish brown loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium. This soil is easily worked. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers.

This soil has been used for crops such as sugarcane, taniers, and plantains. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to most urban uses. Capability subclass IIe.

HtE— Humatas clay, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes and ridgetops of strongly dissected humid uplands (fig. 6). Slopes are convex and are 200 to 1000 feet long. The areas range from 10 to 300 acres.

Typically the surface layer is dark brown, friable clay about 5 inches thick. The subsoil is about 29 inches thick; it is red friable clay and yellowish red, friable silty clay. The substratum, beginning at a depth of 34 inches, is red, dark red, yellowish red, strong brown, and olive yellow, friable silty clay saprolite.

Included with this soil in mapping are some narrow foot slopes and soils that have less than 20 percent slopes. Also included are spots of Consumo soils and, on a few hilltops, small areas of Daguey soils. The surface layer of the Consumo soils is reddish brown clay, and that of the Daguey soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hill-

side ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as taniers, plantains, yams, tobacco, and coffee. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and eucalyptus trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

HtF—Humatas clay, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes and ridgetops of strongly dissected humid uplands. Slopes are convex and are 200 to 1000 feet long. The areas range from 10 to 500 acres.

Typically the surface layer is dark brown, friable clay about 5 inches thick. The subsoil is about 29 inches thick; it is red friable clay and yellowish red, friable silty clay. The substratum, beginning at a depth of 34 inches, is red, dark red, yellowish red, strong brown, and olive yellow, friable silty clay saprolite.

Included with this soil in mapping are some spots of Consumo soils and, on a few hilltops, small areas of Daguey soils. The surface layer of the Consumo soils is reddish brown clay, and that of the Daguey soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as taniers, plantains, yams, tobacco, and coffee. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and eucalyptus trees. Production of Honduras pine is moderate, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

HuF—Humatas-Rock outcrop complex, 20 to 60 percent slopes. This complex consists of steep and very steep, well drained Humatas soils and Rock outcrop on side slopes and narrow ridgetops of the volcanic humid uplands. Slopes are mostly convex and 200 to 800 feet long. The areas have rough surfaces that are covered with rock outcrops. The areas range from 20 to 100 acres. Humatas clay occurs in areas between the outcrops of rock in such an intricate pattern that it was not practical to separate them in mapping. The dark brown clay surface layer of the Humatas soils contrasts markedly with the outcrops and other included soils.

This complex is about 45 percent Humatas clay, 40 percent Rock outcrop, and 15 percent other soils.

Typically the surface layer of the Humatas soil in this complex is dark brown, friable clay about 5 inches thick. The subsoil is about 29 inches thick; it is red, friable clay and yellowish red, friable silty clay. The substratum, beginning at a depth of 34 inches, is red, dark red, yellowish red, strong brown, and olive yellow, friable silty clay saprolite. The other component of this complex consists of boulders ranging from 5 to 15 feet in diameter and outcrops of rock.

Included with this complex in mapping, making up about 15 percent of the areas, are other soils with variable properties.

Most areas of this complex are in brush and brushy pasture. Runoff is rapid, and erosion is a hazard. Because of steep to very steep slopes and the large number of boulders and outcrops of rock on the surface, the potential for farming is very poor. This soil has very poor potential for most urban uses because it is steep to very steep. Potential is best for growing trees and developing habitat for woodland wildlife. The hazard of erosion is severe. Removal of vegetation should be held to a minimum.

This complex is suitable for Honduras pine and eucalyptus trees. Productivity is moderate, the hazard of erosion is high, and there are limitations to the use of equipment. Management practices such as removal of undesirable brush, trees, and grasses and erosion control measures are difficult to apply.

This complex is limited for most urban uses because the soils are steep to very steep and rocky. Capability subclass VIIs.

Hy—Hydraquents, saline. These are nearly level, very poorly drained soils in lagoonlike places and in depressions adjacent to the coast. The areas range from 20 to 200 acres. These soils are covered with brackish water most of the year and are frequently flooded.

Color and texture vary throughout the profile of the soil. The underlying material ranges from sand to clay.

Permeability is very slow, and the available water capacity is very high. Runoff is very slow. Reclamation is very difficult and costly.

These soils support mangrove trees and other halophytic vegetation most of the time. They have severe limitations for most urban uses because they are very poorly drained and are subject to frequent overflow. Capability subclass VIIIw.

JaE2—Jagueyes loam, 20 to 40 percent slopes, eroded. This is a steep, well drained soil on side slopes and narrow ridgetops. Slopes are 100 to 500 feet long. The areas range from 10 to 100 acres.

Typically the surface layer is dark yellowish brown, friable loam about 5 inches thick. The subsoil is about 49 inches thick; it is yellowish red and red, friable clay loam to a depth of 41 inches. From 41 to 54 inches, it is red, friable sandy clay loam mottled with brownish yellow and light gray. The substratum, beginning at a depth of 54 inches, is yellowish red, friable, sandy clay loam saprolite.

Included with this soil in mapping are small areas of Lirios and Limones soils. Also included on some hilltops are areas of Jagueyes soils where slopes are less than 20 percent. The surface layer of the Lirios soil is brown silty clay loam, and that of the Limones soil is dark yellowish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is low. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for taniers and plantains. It is suited to pangolagrass, improved bermudagrass, Merker grass, and molasses grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine. Production of Honduras pine is moderate, about 1200 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

JnD2—Juncal clay, 5 to 20 percent slopes, eroded. This is a sloping to moderately steep, moderately well drained soil on foot slopes and low rounded hills. Slopes are concave and are 100 to 200 feet long. The areas range from 10 to 100 acres.

Typically the surface layer is dark grayish brown, firm clay about 10 inches thick. The subsoil is about 38 inches thick; it is dark yellowish brown, yellowish brown, and brownish yellow, firm clay. The substratum, beginning at a depth of 48 inches, is brownish yellow, friable silty clay loam.

Included with this soil in mapping are small areas of Colinas soils. The surface layer of the Colinas soils is dark brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium, and erosion is a hazard. This soil is difficult to work because it is sloping to moderately steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond to heavy applications of fertilizers. Controlling erosion is the major concern of management.

This soil has been used for yams, taniers, and pigeon peas. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and grazing of pasture, as well as fertilizing, are chief management needs.

This soil is suited to Honduras pine and Honduras mahogany. Production of Honduras pine is moderate, about 1200 board feet per acre per year. The hazard of erosion is the major concern of management. All logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is sloping to moderately steep. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

JuC—Juncos clay, 5 to 12 percent slopes. This is a sloping, moderately well drained soil on side slopes and foot slopes of strongly dissected uplands. Slopes are 100 to 500 feet long. The areas range from 5 to 100 acres.

Typically the surface layer is black, firm clay about 8 inches thick. The subsoil is about 10 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 18 inches, is olive brown, firm clay. Volcanic rock is at a depth of 40 inches.

Included with this soil in mapping are spots of Mabi soils. The surface layer of the Mabi soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is moderate in this soil. Runoff is medium, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because of stickiness and plasticity of clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers. Controlling erosion is the major concern of management.

This soil has been used for coffee, taniers, plantains, and pigeon peas. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Eucalyptus robusta, and Honduras mahogany. Production of Honduras pine is moderate, about 1000 board feet per acre per year. The hazard of erosion is the major concern of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because of slope, its clayey nature, and a high shrink-swell potential. If the soil is used as construction sites, development should be on the contour. Removal of the vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

JuD—Juncos clay, 12 to 20 percent slopes. This is a moderately steep, moderately well drained soil on side slopes and foot slopes of strongly dissected uplands. Slopes are 100 to 300 feet long. The areas range from 5 to 100 acres.

Typically the surface layer is black, firm clay about 8 inches thick. The subsoil is about 10 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 18 inches, is olive brown, firm clay. Volcanic rock is at a depth of 40 inches.

Included with this soil in mapping are spots of Mabi and Mucara soils. The surface layer of the Mabi and Mucara soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because of the slope and the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers. Controlling erosion is the major concern of management.

This soil has been used for coffee, taniers, plantains, and pigeon peas. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Eucalyptus robusta, and Honduras mahogany. Production of Honduras pine is moderate, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because of slope, its clayey nature, and a high shrink-swell potential. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

LaB Lares clay, 2 to 5 percent slopes. This is a gently sloping, somewhat poorly drained soil on terraces. Slopes are smooth and are 200 to 800 feet long. The areas range from 50 to 500 acres.

Typically the surface layer is dark brown, firm clay about 6 inches thick. The subsoil is about 30 inches thick; it is red and yellowish red, firm clay. The substratum, beginning at a depth of 36 inches, is brownish yellow, red, very pale brown, and dark yellowish brown, firm clay.

Included with this soil in mapping are spots of Daguey soils. The surface layer of the Daguey soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for sugarcane, plantains, and coffee. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, kadam, mahoe, and Eucalyptus robusta. Production of Honduras pine is moderate, about 1300 board feet per acre per year. The hazard of erosion is slight, and the limitations for the use of equipment is moderate.

This soil is limited for most urban uses because it is too clayey. Removal of vegetation should be held to a minimum, and a temporary plant cover established quickly in denuded areas. Capability subclass IIe.

LaC2—Lares clay, 5 to 12 percent slopes, eroded. This is a sloping, somewhat poorly drained soil on terraces. Slopes are smooth and are 200 to 800 feet long. The areas range from 50 to 500 acres. This soil has lost much of its original surface layer through erosion.

Typically the surface layer is dark brown, firm clay about 6 inches thick. The subsoil is about 30 inches thick; it is red and yellowish red, firm clay. The substratum, beginning at a depth of 36 inches, is brownish yellow, red, very pale brown, and dark yellowish brown, firm clay.

Included with this soil in mapping are spots of Daguey soils. The surface layer of the Daguey soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is medium. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for sugarcane, plantains, and coffee. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing of pasture, as well as liming and fertilizing, are the chief management needs (fig. 7).

This soil is suited to Honduras pine, Honduras mahogany, kadam, mahoe, and Eucalyptus robusta. Production of Honduras pine is moderate, about 1300 board feet per acre per year. The hazard of erosion is slight, and the limitations on the use of equipment are moderate.

This soil is limited for most urban uses because it is too clayey. A temporary plant cover should be established quickly in denuded areas. Capability subclass IIIe.

LmE—Limones clay, 20 to 40 percent slopes. This is a steep, moderately well drained soil on side slopes and narrow ridgetops. Slopes are irregular and are 100 to 500 feet long. The areas are 10 to 200 acres.

Typically the surface layer is dark yellowish brown, friable clay about 7 inches thick. The subsoil is about 41 inches thick; it is yellowish brown and red, firm clay. The substratum, beginning at a depth of 48 inches, is red, friable clay saprolite.

Included with this soil in mapping are narrow ridges that have less than 20 percent slopes and spots of Lirios and Pandura soils. The surface layer of the Lirios soils is brown silty clay loam, and that of the Pandura soil is dark brown sandy loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate in this soil. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. The soil is difficult to work because it is steep (fig. 8). Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as taniers, plantains, and yams. It is suited to pangolagrass, improved bermudagrass, Merker grass, and molasses grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine. Production of Honduras pine is moderate, about 1300 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

LmF—Limones clay, 40 to 60 percent slopes. This is a very steep, moderately well drained soil on side slopes and narrow ridgetops. Slopes are irregular and are 100 to 500 feet long. The areas range from 20 to 100 acres. A few shallow to deep gullies have formed.

Typically the surface layer is dark yellowish brown, friable clay about 7 inches thick. The subsoil is about 41 inches thick; it is yellowish brown and red, firm clay. The substratum, beginning at a depth of 48 inches, is red, friable clay saprolite.

Included with this soil in mapping are some narrow ridgetops where slopes are less than 40 percent. Also included are spots of Lirios and Pandura soils. The surface layer of the Lirios soils is brown silty clay loam, and that of the Pandura soil is dark brown sandy loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. The soil is difficult to work because it is very steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as plantains, yams, and taniers. It is suited to pangolagrass and improved bermudagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine. Production of Honduras pine is low, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and

temporary plant cover established quickly in denuded areas. Capability subclass VIe.

LoF2—Lirios silty clay loam, 20 to 60 percent slopes, eroded. This is a steep to very steep, well drained soil on side slopes and narrow ridgetops of the granitic humid uplands. Slopes are irregular and are 100 to 300 feet long. The areas range from 10 to 500 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is brown, friable silty clay loam about 4 inches thick. The subsoil is about 20 inches thick; it is brown, friable silty clay loam in the upper part and red, friable clay in the lower part. The substratum, beginning at a depth of 24 inches, is variegated red, yellowish red, yellowish brown, brown, very pale brown, and white, friable clay and silty clay loam saprolite.

Included with this soil in mapping are small areas of Pandura and Limones soils. The surface layer of the Pandura soils is dark brown sandy loam, and that of the Limones soils is dark yellowish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate in this soil. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep to very steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for taniers, plantains, tobacco, bananas, and sweet potatoes. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep to very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

LsE—Los Guineos clay, 20 to 40 percent slopes. This steep, moderately well drained soil is on side slopes of strongly dissected uplands. Slopes are irregular and are 300 to 1000 feet long. The areas range from 200 to 1000 acres. A few shallow gullies have formed.

Typically the surface layer is dark yellowish brown, friable clay about 4 inches thick. The subsoil is about 44 inches thick; it is yellowish brown, red, and brownish yellow, firm clay with some white mottles in the lower part. The substratum, beginning at a depth of 48 inches, is red, friable clay saprolite mottled with brownish yellow, yellow, and white.

Included with this soil in mapping are some rounded hilltops and narrow foot slopes where slopes are less than 20 percent Also included are spots of Humatas, Consumo, and Naranjito soils. The surface layer of the Humatas soils is dark brown clay and that of the Naranjito soils is brown to dark brown silty clay loam. The surface layer of the Consumo soils is reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is high in this soil. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for coffee and bananas. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta. Production of Honduras pine is moderate, about 1400 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of plant seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

LsF—Los Guineos clay, 40 to 60 percent slopes. This is a very steep, moderately well drained soil on side slopes of strongly dissected uplands. Slopes are irregular and are 200 to 800 feet long. The areas range from 200 to 1000 acres. A few shallow gullies have formed.

Typically the surface layer is dark yellowish brown, friable clay about 4 inches thick. The subsoil is about 44 inches thick; it is yellowish brown, red, and brownish yellow, firm clay with some white mottles in the lower part. The substratum, beginning at a depth of 48 inches, is red, friable clay saprolite mottled with brownish yellow, yellow, and white.

Included with this soil in mapping are some hilltops where slopes are less than 40 percent and some very steep ridges where they are more than 60 percent. Also

included are spots of Consumo soils. The surface layer of the Consumo soils is reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for coffee and bananas.

This soil is suited to Honduras pine and Eucalyptus robusta. Production of Honduras pine is low, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of plant seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

MaA—Mabi clay, 0 to 2 percent slopes. This is a nearly level, somewhat poorly drained soil on alluvial fans and terraces above the river flood plains. Slopes are smooth and are 100 to 300 feet long. The areas range from 10 to 50 acres.

Typically the surface layer is very dark grayish brown, very firm clay about 7 inches thick. The subsoil is about 17 inches thick; it is dark yellowish brown and yellowish brown, very firm clay mottled with gray. The substratum, beginning at a depth of 24 inches, is yellowish brown, very firm clay mottled with gray and greenish gray.

Included with this soil in mapping are small areas of Montegrande soils. The surface layer of the Montegrande soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of the high shrink-swell potential (fig. 9) and the flood hazard. Capability subclass IIw.

MaB—Mabi clay, 2 to 5 percent slopes. This is a gently sloping, somewhat poorly drained soil on alluvial fans and terraces above the river flood plains. Slopes are gently undulating and are 100 to 300 feet long. The areas range from 10 to 100 acres.

Typically the surface layer is very dark grayish brown, very firm clay about 7 inches thick. The subsoil is about 17 inches thick; it is dark yellowish brown and yellowish brown, very firm clay mottled with gray. The substratum, beginning at a depth of 24 inches, is yellowish brown, very firm clay mottled with gray and greenish gray.

Included with this soil in mapping are small areas of Montegrande soils. The surface layer of the Montegrande soils is very dark grayish brown clay. These soils make up 10 to 20 percent of the areas of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of the high shrink-swell potential and the flood hazard. Capability subclass IIw.

MaC—Mabi clay, 5 to 12 percent slopes. This is a sloping, somewhat poorly drained soil on alluvial fans and terraces above the river flood plains. Slopes are undulating and are 100 to 200 feet long. The areas range from 10 to 50 acres.

Typically the surface layer is very dark grayish brown, very firm clay about 7 inches thick. The subsoil is about 17 inches thick; it is dark yellowish brown and yellowish brown, very firm clay mottled with gray. The substratum, beginning at a depth of 24 inches, is yellowish brown, very firm clay mottled with gray and greenish gray.

Included with this soil in mapping are small areas of Montegrande soils. The surface layer of the Montegrande soils is very dark grayish brown clay. These soils make up 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is limited for most urban uses because of the high shrink-swell potential and the flood hazard. Capability subclass IIIe.

Md—Made land. Made land consists of areas that have been covered with gravel, rock, concrete blocks, and other debris. It has been built up for industrial uses and is not suited to farming.

MlF—Malaya clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes of strongly dissected volcanic uplands. Slopes are irregular and are 100 to 300 feet long. The areas range from 10 to 100 acres. A few shallow and deep gullies have formed.

Typically the surface layer is dark brown, friable clay about 6 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm gravelly clay. The substratum, beginning at a depth of 13 inches, is dark yellowish brown, firm gravelly clay loam. Bedrock is at a depth of 18 inches.

Included with this soil in mapping are spots of Caguabo soils. The surface layer of the Caguabo soils is dark grayish brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is fertile, but is difficult to work because it is very steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is shallow. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is very low, about 700 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIs.

MoF—Maricao clay, 20 to 60 percent slopes. This is a steep to very steep, well drained soil on side slopes and narrow hilltops of the strongly dissected uplands. Slopes are irregular and are 300 to 800 feet long. The areas range from 20 to 500 acres. A few shallow and deep gullies have formed.

Typically the surface layer is reddish brown, friable clay about 6 inches thick. The subsoil is about 16 inches thick; it is red, friable clay in the upper part and silty clay in the lower part. The substratum, beginning at a depth of 22 inches, is red, strong brown, and pale brown, friable silty clay loam saprolite.

Included with this soil in mapping are spots of Consumo soils. Also included are some very severely eroded ridgetops. The surface layer of the Consumo soils is reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep to very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1300 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep to very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

Mp—Martin Pena muck. This is a nearly level, very poorly drained soil in low depressional areas of the humid coastal plains and river flood plains. The areas range from 10 to 800 acres.

Typically the surface layer is black muck about 8 inches thick. The underlying material is mostly mottled very dark brown and greenish gray clay.

Included with this soil in mapping are spots of Saladar and Bajura soils. The surface layer of the Saladar soils is black muck, and that of the Bajura soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is very slow and the available water capacity is very high. Runoff is slow. This soil is very difficult to work because of wetness. A very complex and expensive drainage system is needed if it is to be reclaimed.

This soil has been in cattails, sedges, papyrus, and other hydrophytic vegetation most of the time. It is suited to paragrass.

This soil is limited for most urban uses because of wetness, slow permeability, and the flood hazard. Capability subclass VIIw.

MsB—Matanzas clay, 2 to 5 percent slopes. This is a gently sloping, well drained soil on foot slopes and in small valleys between the limestone hills. Slopes are

gently undulating and are 200 to 1000 feet long. The areas range from 10 to 300 acres.

Typically the surface layer is dark reddish brown, firm clay about 7 inches thick. The subsoil is about 46 inches thick; it is dark reddish brown and red, friable clay. Limestone bedrock is at a depth of 53 inches.

Included with this soil in mapping are some spots of Bayamon soils. The surface layer of the Bayamon soils is dark reddish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is slow. This soil is difficult to work. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers.

This soil has been used for crops such as plantains, yams, and taniers. It is suited to pangolagrass, Merker grass, and paragrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil has limitations for most urban uses because of its clayey nature. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIe.

MtB—Montegrande clay, 2 to 5 percent slopes. This is a gently sloping, moderately well drained soil on alluvial fans and foot slopes of the volcanic uplands. Slopes are smooth and are 100 to 300 feet long. The areas range from 30 to 50 acres.

Typically the surface layer is very dark grayish brown, firm clay about 7 inches thick. The subsoil is about 14 inches thick; it is dark brown and grayish brown, firm clay mottled with yellowish brown, gray, and greenish gray. The substratum from a depth of 21 inches to 29 inches is mixed dark yellowish brown and yellowish brown, firm clay. From 29 inches to 48 inches it is brown and yellowish brown very gravelly clay.

Included with this soil in mapping are spots of Mabi soils. The surface layer of the Mabi soils is very dark grayish brown, very firm clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers.

This soil has been used for sugarcane.

This soil is limited for most urban uses because of its clayey nature, the high shrink-swell potential, and the flood hazard. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIw.

MtC—Montegrande clay, 5 to 12 percent slopes. This is a sloping, moderately well drained soil on alluvial fans and foot slopes of the volcanic uplands. Slopes are undulating and are 100 to 200 feet long. The areas range from 20 to 40 acres.

Typically the surface layer is very dark grayish brown, firm clay about 7 inches thick. The subsoil is about 14 inches thick; it is dark brown and grayish brown, firm clay mottled with yellowish brown, gray, and greenish gray. The substratum from a depth of 21 inches to 29 inches is mixed dark yellowish brown and yellowish brown, firm clay. From 29 inches to 48 inches it is brown and yellowish brown very gravelly clay.

Included with this soil in mapping are spots of Mabi soils. The surface layer of the Mabi soils is very dark grayish brown, very firm clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium, and erosion is a hazard. This soil is difficult to work because of stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers. Controlling erosion is the major concern of management.

This soil has been used for sugarcane.

This soil is limited for most urban uses because of slope, clayey nature, and high shrink-swell potential. Capability subclass IIIe.

MuF2—Morado clay loam, 40 to 60 percent slopes, eroded. This is a very steep, well drained soil on side slopes, foot slopes, and hilltops of strongly dissected humid uplands. Slopes are irregular and are 200 to 1000 feet long. The areas range from 70 to 500 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is weak red, friable clay loam about 8 inches thick. The subsoil is about 18 inches thick; it is reddish gray, dark reddish gray, red, weak red, and strong brown, friable clay loam. The substratum, beginning at a depth of 26 inches is variegated gray, light gray, and dark reddish gray clay loam saprolite. Bedrock is at a depth of 34 inches.

Included with this soil in mapping are spots of Caguabo soils. The surface layer of the Caguabo soils is dark grayish brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. Fertility is high. Controlling erosion is the major concern of management.

This soil has been in brushy forest and brushy pasture most of the time. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is low, about 900 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major

concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

MxD—Mucara clay, 12 to 20 percent slopes. This is a moderately steep, well drained soil on foot slopes, side slopes, and rounded hilltops of strongly dissected uplands. Slopes are irregular and are 300 to 800 feet long. The areas range from 20 to 100 acres.

Typically the surface layer is very dark grayish brown, firm clay about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is highly weathered volcanic rock. Bedrock is at a depth of 30 inches.

Included with this soil in mapping are spots of Juncos and Naranjito soils. The surface layer of the Juncos soils is black clay, and that of the Naranjito soils is brown to dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is moderately steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. This soil is fertile. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as coffee, taniers, plantains, and pigeon peas. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Eucalyptus robusta, and Honduras mahogany. Production of the Honduras pine is low, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is moderately steep. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

MxE—Mucara clay, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes and rounded hilltops of strongly dissected uplands. Slopes are irregular and are 200 to 1000 feet long. The areas range from 100 to 500 acres. A few shallow and deep gullies have formed.

Typically the surface layer is very dark grayish brown, firm clay about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is highly weathered volcanic rock. Bedrock is at a depth of 30 inches.

Included with this soil in mapping are spots of Caguabo and Naranjito soils. Also included are some hilltops that have many rocks and boulders on the surface. The surface layer of the Caguabo soils is dark grayish brown clay loam, and that of the Naranjito soils is brown to dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. The soil is fertile. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs. This soil is suited to Honduras pine and Eucalyptus robusta. Production of Honduras pine is low, about 900 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and is shallow to rock. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

MxF—Mucara clay, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes and rounded hilltops of strongly dissected uplands. Slopes are irregular and are 100 to 800 feet long. The areas range from 100 to 1000 acres. A few shallow and deep gullies have formed.

Typically the surface layer is very dark grayish brown, firm clay about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is highly weathered volcanic rock. Bedrock is at a depth of 30 inches.

Included with this soil in mapping are spots of Caguabo and Naranjito soils. Also included are some hilltops that

have many rocks and boulders on the surface. The surface layer of the Caguabo soils is dark grayish brown clay loam, and that of the Naranjito soils is brown to dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. This soil is fertile. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and grazing of pasture, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta. Production of Honduras pine is low, about 900 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of plant seedlings.

This soil is limited for most urban uses because it is very steep and it is shallow to rock. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

NaD2—Naranjito silty clay loam, 12 to 20 percent slopes, eroded. This is a moderately steep, well drained soil on strongly dissected volcanic uplands. Slopes are irregular and are 100 to 500 feet long. The areas range from 20 to 200 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is brown to dark brown, friable silty clay loam about 4 inches thick. The subsoil is about 20 inches thick; it is reddish brown and yellowish red firm clay. The substratum, beginning at a depth of 24 inches, is variegated yellowish red, red, and light yellowish brown, friable, clay loam saprolite. Bedrock is at a depth of 40 inches.

Included with this soil in mapping are spots of Mucara and Consumo soils. The surface layer of the Mucara soils is very dark grayish brown clay and that of the Consumo soils is reddish brown clay. These soils make up 10 to 20 percent of the areas of this mapping unit.

Permeability and the available water capacity are moderate in this soil. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is moderately steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as plantains and bananas. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, kadam, mahoe, and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is moderately steep and is subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

NaE2—Naranjito silty clay loam, 20 to 40 percent slopes, eroded. This is a steep, well drained soil on strongly dissected uplands. Slopes are irregular and are 100 to 400 feet long. The areas range from 50 to 100 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is brown to dark brown, friable silty clay loam about 4 inches thick. The subsoil is about 20 inches thick; it is reddish brown and yellowish red, firm clay. The substratum, beginning at a depth of 24 inches, is variegated yellowish red, red, and light yellowish brown, friable, clay loam saprolite.

Included with this soil in mapping are spots of Mucara and Caguabo soils. The surface layer of the Mucara soils is very dark grayish brown clay, and that of the Caguabo soils is dark grayish brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, kadam, mahoe, and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and is subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

NaF2—Naranjito silty clay loam, 40 to 60 percent slopes, eroded. This is a very steep, well drained soil on strongly dissected uplands. Slopes are irregular and are 200 to 800 feet long. The areas range from 30 to 1000 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is brown to dark brown, friable silty clay loam about 4 inches thick. The subsoil is about 20 inches thick; it is reddish brown and yellowish red, firm clay. The substratum, beginning at a depth of 24 inches, is variegated yellowish red, red, and light yellowish brown, friable, clay loam saprolite.

Included with this soil in mapping are spots of Mucara and Caguabo soils. The surface layer of the Mucara soils is very dark grayish brown clay, and that of the Caguabo soils is dark grayish brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. Natural fertility is medium. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is low, about 900 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and is subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

PaD—Pandura sandy loam, 12 to 20 percent slopes. This is a moderately steep, well drained soil on side slopes of dissected uplands. Slopes are irregular and are 100 to 300 feet long. The areas range from 10 to 300 acres.

Typically the surface layer is dark brown, friable sandy loam about 7 inches thick. The subsoil is about 5 inches thick; it is dark yellowish brown, friable sandy loam. The substratum, beginning at a depth of 12 inches, is very pale brown, pale brown, dark yellowish brown, and white sandy loam saprolite.

Included with this soil in mapping are spots of Limones and Jagueyes soils. The surface layer of the Limones soils is dark yellowish brown clay, and that of the Jagueyes soils is dark yellowish brown loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is medium, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is moderately steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is shallow. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Eucalyptus robusta, and mahoe trees. Production of Honduras pine is moderate, about 1200 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is moderately steep and shallow to rock. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

PaE—Pandura sandy loam, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes of dissected uplands. Slopes are irregular and are 100 to 400 feet long. The areas range from 50 to 500 acres.

Typically the surface layer is dark brown, friable sandy loam about 7 inches thick. The subsoil is about 5 inches thick; it is dark yellowish brown, friable sandy loam. The substratum, beginning at a depth of 12 inches, is very pale brown, pale brown, dark yellowish brown, and white sandy loam saprolite.

Included with this soil in mapping are spots of Limones and Jagueyes soils. Also included are a few spots of rock land. The surface layer of the Limones soils is dark yellowish brown clay and that of the Jagueyes soils is dark yellowish brown loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is shallow. Natural fertility is medium. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Eucalyptus robusta, and mahoe trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and shallow to rock. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

PaF—Pandura sandy loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes of dissected uplands. Slopes are irregular and are 200 to 800 feet long. The areas range from 50 to 1000 acres. A few shallow and deep gullies have formed.

Typically the surface layer is dark brown, friable sandy loam about 7 inches thick. The subsoil is about 5 inches thick; it is dark yellowish brown, friable sandy loam. The substratum, beginning at a depth of 12 inches, is very pale brown, pale brown, dark yellowish brown, and white sandy loam saprolite.

Included with this soil in mapping are spots of Limones and Jagueyes soils. Also included are few spots of rock land. The surface layer of the Limones soils is dark yellowish brown clay, and that of the Jagueyes soils is dark yellowish brown loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is shallow. Natural fertility is medium. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is low, about 900 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and shallow to rock. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

PeF—Pellejas clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on short side slopes and narrow ridges of the strongly dissected humid uplands. Slopes are irregular and are 100 to 300 feet long. The areas range from 20 to 200 acres. A few shallow and deep gullies have formed.

Typically the surface layer is dark brown, friable clay loam about 4 inches thick. The subsoil is about 12 inches thick; it is yellowish brown clay loam. The substratum, beginning at a depth of 16 inches, is pale brown, light yellowish brown, gray, pinkish gray, and dark greenish gray very friable sandy loam saprolite.

Included with this soil in mapping are spots of Lirios soils. Also included are small areas that have slopes less than 40 percent. The surface layer of the Lirios soils is brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is rapid, and the available water capacity is low. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is low, about 900 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour.

Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

Re—Reilly sandy loam. This is a nearly level, excessively drained soil on river flood plains adjacent to streams. The areas range from 10 to 100 acres.

Typically the surface layer is dark brown, very friable sandy loam about 7 inches thick. The underlying material is dark grayish brown gravelly sand to a depth of 18 inches and is coarse clean sand and gravel below 18 inches.

Included with this soil in mapping are spots of riverwash consisting of large size gravel. The spots of riverwash make up 10 to 20 percent of this mapping unit.

Permeability is rapid, and the available water capacity is low. Runoff is slow. This soil is easily worked. The root zone is shallow. Natural fertility is low.

This soil has been in brush and brushy pasture. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of the flood hazard and seepage. Capability subclass IVs.

RoB—Rio Arriba clay, 2 to 5 percent slopes. This is a gently sloping, moderately well drained soil on alluvial fans and terraces above the river flood plains. Slopes are gently undulating and are 100 to 500 feet long. The areas range from 15 to 400 acres.

Typically the surface layer is brown, firm clay about 8 inches thick. The subsoil from 8 to 28 inches is yellowish brown, firm clay and from 28 to 60 inches is reddish yellow, firm clay. Below a depth of 16 inches, the subsoil is mottled with yellowish red and red.

Included with this soil in mapping are small areas of Mabi soils. The surface area of the Mabi soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is medium, and erosion is a hazard. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, paragrass, and bermudagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of its clayey nature, slow permeability, high shrink-swell potential, and the flood hazard. Capability subclass IIs.

RoC2—Rio Arriba clay, 5 to 12 percent slopes, eroded. This is a sloping, moderately well drained soil on alluvial fans and terraces above the river flood plains. Slopes are undulating and are 100 to 500 feet long. The areas range from 10 to 300 acres. This soil has lost much of the surface layer through erosion.

Typically the surface layer is brown, firm clay about 8 inches thick. The subsoil from 8 to 28 inches is yellowish brown, firm clay and from 28 to 60 inches is reddish yellow, firm clay. Below a depth of 16 inches, the subsoil is mottled with yellowish red and red.

Included with this soil in mapping are small areas of Juncos and Mabi soils. The surface area of the Juncos soils is black clay, and that of the Mabi soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is rapid, and erosion is a hazard. This soil is difficult to work. The root zone is deep. Natural fertility is medium. Crops respond well to lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, paragrass, and bermudagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of its clayey nature, slow permeability, high shrink-swell potential, and the flood hazard. Capability subclass IIIe.

RpD2—Rio Piedras clay, 12 to 20 percent slopes, eroded. This is a moderately steep, well drained soil on foot slopes and side slopes of dissected uplands. Slopes are irregular and are 100 to 300 feet long. The areas range from 10 to 300 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is dark brown, firm clay about 8 inches thick. The subsoil is about 20 inches thick; it is red, very firm clay with yellowish brown, red, and brownish yellow mottles. The substratum, beginning at a depth of 28 inches, is mixed red and brownish yellow clay saprolite with strong brown and light gray mottles. Cemented shale bedrock is at a depth of 48 inches.

Included with this soil in mapping are spots of Yunes soils. The surface layer of the Yunes soils is dark reddish brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is moderately steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is low. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for plantains. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, kadam, mahoe, and Eucalyptus robusta trees.

Production of Honduras pine is moderate, about 1300 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil if soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is moderately steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

RpE2—Rio Piedras clay, 20 to 40 percent slopes, eroded. This is a steep, well drained soil on side slopes of dissected uplands. Slopes are irregular and are 100 to 200 feet long. The areas range from 20 to 200 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is dark brown, firm clay about 8 inches thick. The subsoil is about 20 inches thick; it is red, very firm clay with yellowish brown, red, and brownish yellow mottles. The substratum, beginning at a depth of 28 inches, is mixed red and brownish yellow clay saprolite with strong brown and light gray mottles. Cemented shale bedrock is at a depth of 48 inches.

Included with this soil in mapping are spots of Yunes soils. The surface layer of the Yunes soils is dark reddish brown silty clay loam. These soils make up about 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is low. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

RpF2—Rio Piedras clay, 40 to 60 percent slopes, eroded. This a very steep, well drained soil on side slopes of dissected uplands. Slopes are irregular and are 100 to 300 feet long. The areas range from 50 to 400 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is dark brown, firm clay about 8 inches thick. The subsoil is about 20 inches thick; it is red, very firm clay with red, brownish yellow, and yellowish brown mottles. The substratum, beginning at a depth of 28 inches, is mixed red and brownish yellow clay saprolite with strong brown and light gray mottles.

Included with this soil in mapping are a few spots of Yunes soils. Also included are severely eroded spots on tops of ridges and along drains where the substratum is exposed. The surface layer of the Yunes soils is dark reddish brown, silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is low. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep, and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

SaF—Sabana silty clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes and tops of humid volcanic uplands. Slopes are irregular and are 100 to 800 feet long. The areas range from 20 to 300 acres. A few shallow and deep gullies have formed.

Typically the surface layer is very dark grayish brown, firm silty clay loam about 3 inches thick. The subsoil is about 12 inches thick; it is dark brown, friable silty clay

in the upper part and variegated light brownish gray and strong brown, firm clay in the lower part. Consolidated volcanic rock is at a depth of 15 inches.

Included with this soil in mapping are spots of Mucara and Caguabo soils. Also included are some ridges with boulders and stones on the surface. The surface layer of the Mucara soils is very dark grayish brown clay, and that of the Caguabo soils is dark grayish brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is shallow. Natural fertility is medium. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is very low, about 700 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIs.

ScB—Sabana Seca clay, 2 to 8 percent slopes. This is a gently sloping, poorly drained soil on coastal plains. The areas range from 10 to 200 acres.

Typically the surface layer is very dark grayish brown, firm clay about 10 inches thick. The clay subsoil is highly mottled. The dominant color from 10 to 13 inches is dark grayish brown, from 13 to 36 inches is light gray, and from 36 to 70 inches is white. The mottles are yellowish brown, red, dark red, dusky red, and strong brown.

Included with this soil in mapping are spots of Almirante soils. The surface layer of the Almirante soils is dark yellowish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is very slow, and the available water capacity is high. Runoff is very slow. This soil is very difficult to work because of wetness and because of the stickiness and plasticity of the clay. The root zone is shallow. Natural fertility is low.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass, common bermudagrass, paragrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because it is wet and clayey. Capability subclass IIIw.

Sm—Saladar muck. This is a level, very poorly drained soil in closed depressions and in coastal marshes with inadequate outlets. The areas range from 10 to 700 acres.

Typically the surface layer is black muck about 10 inches thick. The underlying layers to a depth of 51 inches or more are black muck.

Included with this soil are spots of Martin Pena soils. The surface layer of the Martin Pena soils is black muck about 8 inches thick that overlies clayey material. These soils make up about 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because it is too wet. Reclamation projects of this soil would be difficult and costly.

This soil has been in cattails, sedges, and reeds most of the time.

This soil is limited for most urban uses because it is too wet and is subject to overflow. Capability subclass VIIIw.

SoE—Soller clay loam, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes and hilltops of rounded limestone hills. Slopes are convex, and are 100 to 300 feet long. The areas range from 20 to 100 acres.

Typically the surface layer is very dark grayish brown, friable clay loam about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is yellow, friable, weathered limestone. Hard limestone is at a depth of 24 inches.

Included with this soil in mapping are spots of Colinas soils. Also included are severely eroded small areas on hilltops and along drainageways where the hard fragmental limestone parent material is exposed. The surface layer of the Colinas soils is dark brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is shallow. Natural fertility is low. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is suited to Honduras mahogany. Production of Honduras mahogany is low, about 350 board feet per acre per year. The hazard of erosion and limitations in the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and

slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and shallow to bedrock. If this soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

SoF—Soller clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes and hilltops of rounded limestone hills. Slopes are convex and are 100 to 200 feet long. The areas range from 30 to 500 acres.

Typically the surface layer is very dark grayish brown, friable clay loam about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is yellow, friable, weathered limestone. Hard limestone bedrock is at a depth of 24 inches.

Included with this soil in mapping are small areas of Colinas soils. Also included are some severely eroded spots on hilltops and along drainageways where the hard fragmental limestone parent material is exposed. The surface layer of the Colinas soils is dark brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is shallow. Natural fertility is low. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is suited to Honduras mahogany. Production of Honduras mahogany is very low, less than 250 board feet per acre per year. The hazard of erosion and limitations in the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and shallow to bedrock. If this soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

TaF—Tanama-Rock outcrop complex, 20 to 60 percent slopes. This complex consists of steep to very steep, shallow, well drained Tanama soils and Rock outcrop. This complex has formed in karst topography characterized by pepino hills or haystack hills in the northern part of the survey area. The topography is very rugged, and slopes in many directions. This irregular topography is caused by the solutional destruction of the dense, thin bedded limestone. Most areas are asymmetrical in form and range from 25 to 300 feet in height. They are about 5 to 100 acres. This complex is about 45 percent Tanama soils, 40 percent Rock outcrop, and 15 percent minor soils.

Tanama soils and Rock outcrop form such an intricate pattern that it was not practical to separate them in mapping. In a representative profile of Tanama soils the surface layer is dark reddish brown, friable clay about 4 inches thick. The subsoil is about 10 inches thick; it is reddish brown, firm clay. Hard semiconsolidated limestone is at a depth of 14 inches.

Included with this complex in mapping are spots of Soller soils. Also included are small areas of miscellaneous soils that have formed between the limestone outcrops and in the crevices and holes formed in the limestone. The surface layer of the Soller soils is very dark grayish brown clay loam.

In the Tanama soils the permeability is moderate and the available water capacity is low. Runoff is rapid, and erosion is a hazard. This soil is difficult to work because it is steep to very steep, and because it is intermingled with Rock outcrop. The root zone is shallow. Natural fertility is low. Most of this complex is in brush.

This complex is limited for most urban uses mainly because of the slopes, rock outcrops, and shallow depth to rock. Capability subclass VIIs.

To—Toa silty clay loam. This is a nearly level, moderately well drained to well drained soil on flood plains (fig. 10). The areas range from 20 to 500 acres.

Typically the surface layer is dark brown, friable silty clay loam about 8 inches thick. The subsoil is about 8 inches thick; it is dark brown, friable silty clay loam with pale brown mottles. The substratum, beginning at a depth of 16 inches, is brown and dark brown, friable silty clay loam with dark reddish brown, light gray, and brown mottles.

Included with this soil in mapping are spots of Dique, Coloso, and Bajura soils. The surface layer of the Dique soils is dark brown loam; that of the Coloso soils is dark brown silty clay loam; and that of the Bajura soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. This soil is easy to work. The root zone is deep. Natural fertility is high. Crops respond well to applications of lime and fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of the flood hazard, its clayey nature, and low strength. Capability class I.

TrB—Torres loamy sand, 2 to 5 percent slopes. This is a gently sloping, excessively drained soil on coastal plains and in trapped valleys among the haystack hills. Slopes are gently undulating and are 50 to 200 feet long. The areas range from 5 to 200 acres.

Typically the surface layer is very dark grayish brown and dark brown, loose loamy sand about 28 inches thick. The subsoil, to a depth of 64 inches, is yellowish brown, firm clay with prominent red, dark red, and light gray mottles.

Included with this soil in mapping are spots of Matanzas and Almirante soils. The surface layer of the Matanzas soils is dark reddish brown clay, and that of the Almirante soils is strong brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is rapid in the surface layer and moderate in the subsoil. The available water capacity is low. Runoff is slow. This soil is easily worked. The root zone is deep. Natural fertility is low.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suitable for most urban uses. It has limitations for some uses because of the clayey subsoil. Capability subclass VIs.

Ts—Tropopsamments. Tropopsamments consist of nearly level, deep, excessively drained soils formed in a thick accumulation of finely ground sea shells and sand. The areas are narrow strips of land that parallel the coast.

Commonly the soils to a depth of 60 inches are pale yellow or yellow, loose sand containing many shells and shell fragments.

Most areas of these soils are devoid of vegetation or they are producing a few coconuts.

These soils are limited for most urban uses because they are subject to the wave action of the sea. Capability subclass VIIIs.

Ud—Urban land-Durados complex. This nearly level complex is about 70 percent Urban land, 20 percent Durados soils, and about 10 percent other soils. The areas range from 500 to 2000 acres. The composition of this unit is about the same from place to place.

In undisturbed areas the surface layer of the Durados soils is very dark grayish brown, very friable sandy loam about 14 inches thick. The underlying material from 14 to 23 inches is very dark grayish brown, loose loamy sand; from 23 to 38 inches is very pale brown and very dark grayish brown loose sand; and from 38 to 60 inches is mixed dark yellowish brown, black, brownish yellow, and yellowish brown, loose sand with thick layers of cemented sand. Urban land consists mainly of sites for houses, industrial buildings, parking lots, streets, and other structures that accompany community development. The landscape has been altered in places by cutting, filling, or grading and shaping. It was not practical to map the soils separately because they were so intricately intermingled with Urban land.

Mapped areas of this complex are only in the populated and industrial areas in the vicinity of Levittown. Capability subclass not assigned.

Um—Urban land-Mucara complex. This complex is about 50 percent Urban land, 30 percent Mucara soils, and about 20 percent Rock outcrop and other soils. Slopes are irregular and are 100 to 300 feet long. The areas range from 500 to 1000 acres.

Typically the surface layer of the Mucara soils is very dark grayish brown, firm clay about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is highly weathered volcanic rock. Hard volcanic rock is at a depth of 30 inches. Urban land consists of areas that have been altered to prepare building sites, create trafficways, or create a better environment for growing lawn grasses and landscape plants.

Included with this complex are Rock outcrop and other minor soils. These make up about 20 percent of this mapping unit. It was not practical to map the soils separately because they were so intricately intermingled with Urban land.

Mapped areas of this complex are only in the populated and industrial areas around cities. Capability subclass not assigned.

Us—Urban land-Sabana Seca complex. This complex is about 60 percent Urban land, 30 percent Sabana Seca soils, and 10 percent other soils. The areas are nearly level to gently sloping and are on coastal plains. They range from 1000 to 3000 acres. The composition of this complex is about the same from place to place.

In undisturbed areas the surface layer of the Sabana Seca soils is very dark grayish brown, firm clay about 10 inches thick. The clay subsoil is highly mottled. The dominant color from 10 to 13 inches is dark grayish brown; from 13 to 36 inches is light gray; and from 36 to 70 inches is white. The mottles are yellowish brown, red, dark red, dusky red, and strong brown. Urban land consists mainly of sites for houses, industrial buildings, parking lots, streets, and other structures that accompany community development. The landscape has been altered in places by cutting, filling, and shaping. It was not practical to map the soils separately because they were so intricately intermingled with Urban land.

Mapped areas of this complex are only in the populated areas in the vicinity of Levittown. Capability subclass not assigned.

Uv—Urban land-Vega Alta complex. This complex is about 60 percent Urban land, 25 percent Vega Alta soils, and 15 percent Aceitunas and Humatas soils. The areas are gently undulating to moderately undulating. They range from 3000 to 5000 acres. The composition of the complex is about the same from place to place.

In undisturbed areas the Vega Alta soils have a surface layer of dark yellowish brown, friable clay loam about 8 inches thick. The subsoil from 8 inches to a depth of 52

inches is mainly red, strong brown, brownish yellow, and dark red clay. From 52 inches to a depth of 84 inches, the subsoil is dark red, brownish yellow, and light gray, friable clay. Urban land consists mainly of sites for houses, industrial buildings, parking lots, streets, and other structures that accompany development. The landscape has been altered in places by cutting, filling, or grading and shaping. It was not practical to map the soils separately because they were so intricately intermingled with Urban land.

Mapped areas of this complex are only in the populated and industrial areas in the vicinities of the San Juan metropolitan area, Bayamon, and other towns and communities. Capability subclass not assigned.

VaB—Vega Alta clay loam, 2 to 5 percent slopes. This is a gently sloping, well drained soil on coastal plains and terraces. Slopes are undulating and are 100 to 200 feet long. The areas range from 10 to 100 acres.

Typically the surface layer is dark yellowish brown, friable clay loam about 8 inches thick. The subsoil from 8 inches to a depth of 52 inches is mainly red, strong brown, brownish yellow, and dark red clay. From 52 inches to a depth of 84 inches, the subsoil is dark red, brownish yellow, and light gray, friable clay.

Included with this soil in mapping are spots of Almirante soils. The surface layer of the Almirante soils is dark yellowish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium, and erosion is a hazard. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, paragrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil has moderate limitations for most urban uses because of its clayey nature and low strength. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIe.

VaC2—Vega Alta clay loam, 5 to 12 percent slopes, eroded. This is a sloping, well drained soil on coastal plains and terraces (fig. 11). Slopes are undulating and are 100 to 300 feet long. The areas range from 20 to 300 acres. This soil has lost much of its original surface layer through erosion.

Typically the surface layer is dark yellowish brown, friable clay loam about 8 inches thick. The subsoil from 8 inches to a depth of 52 inches is mainly red, strong brown, brownish yellow, and dark red clay. From 52 inches to a depth of 84 inches, the subsoil is dark red, brownish yellow, and light gray friable clay.

Included with this soil in mapping are spots of Almirante soils. The surface layer of the Almirante soils is dark yellowish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium, and erosion is a hazard. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, paragrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is moderately limited for most urban uses because it is sloping and clayey and has low strength. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

Vg—Vega Baja silty clay. This is a nearly level, somewhat poorly drained soil on coastal plains and alluvial fans. The areas range from 50 to 100 acres.

Typically the surface layer is dark brown, dark grayish brown, and yellowish brown, firm silty clay to a depth of 12 inches. The subsoil from 12 to 17 inches is dark grayish brown and yellowish brown, firm silty clay; from 17 to 32 inches is mixed strong brown and gray clay; and from 32 to 50 inches is brownish yellow and gray silty clay loam. The substratum, beginning at a depth of 50 inches, is light gray and strong brown, firm clay.

Included with this soil in mapping are spots of Coloso soils. The surface layer of the Coloso soils is dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. This soil is difficult to work because of wetness and because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers.

This soil has been used for sugarcane.

This soil is limited for most urban uses because of the flood hazard, wetness, slow permeability, and its clayey nature. Capability subclass IIw.

VkC2—Via clay loam, 5 to 12 percent slopes, eroded. This is a sloping, well drained soil on high stream terraces. Slopes are undulating and are 100 to 200 feet long. The areas range from 10 to 100 acres. This soil has lost much of its original surface layer through erosion.

Typically the surface layer is dark brown, friable clay loam about 9 inches thick. The subsoil is about 27 inches thick; it is strong brown and yellowish brown, firm clay loam. The substratum, beginning at a depth of 36 inches, is strong brown, firm very gravelly clay loam.

Included with this soil in mapping are spots of Rio Arriba and Mabi soils. The surface layer of the Mabi soils is

very dark grayish brown clay, and that of the Rio Arriba soils is brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium, and erosion is a hazard. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as sugarcane. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil has moderate to severe limitations for most urban uses because of slope, seepage, and its clayey nature. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

Vv—Vivi loam. This is a nearly level, somewhat excessively drained soil on river flood plains. The areas range from 10 to 100 acres.

Typically the surface layer of this soil is dark brown, very friable loam about 9 inches thick. The subsoil is about 13 inches thick; it is dark yellowish brown, friable loam. The substratum, beginning at a depth of 22 inches, is dark yellowish brown loam from 22 inches to 34 inches, yellowish brown, very friable very fine sandy loam from 34 to 47 inches, and yellowish brown loamy sand from 47 to 58 inches.

Included with this soil in mapping are spots of Reilly soils. The surface layer of the Reilly soils is dark brown sandy loam. These soils make up 10 to 20 percent of the areas of this mapping unit.

Permeability is rapid, and the available water capacity is low. This soil is fertile and is easily worked. The root zone is deep. Crops respond well to heavy applications of lime and fertilizers and to irrigation.

This soil has been used for sugarcane.

This soil is limited for most urban uses because of the flood hazard and seepage. Capability subclass IIs.

YeE—Yunes silty clay loam, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes of strongly dissected uplands. The slopes are irregular and are 100 to 300 feet long. The areas range from 20 to 300 acres. A few shallow and deep gullies have formed.

Typically the surface layer is dark reddish brown, friable silty clay loam about 2 inches thick. The subsoil is about 14 inches thick; it is dark brown and brown, friable very shaly silty clay loam. Below a depth of 16 inches is bedded fragmental shale. The beds are 1 to 4 inches thick. The shale is light red, strong brown, and pink.

Included with this soil in mapping are spots of Rio Piedras soils. The surface layer of the Rio Piedras soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is not suited to cultivated crops because it is steep and shallow to bedded shale. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is very low, about 700 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soils are slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used for construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIs.

YeF—Yunes silty clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes of strongly dissected uplands. The slopes are irregular and are 100 to 300 feet long. The areas range from 30 to 250 acres. A few shallow and deep gullies have formed.

Typically the surface layer is dark reddish brown, friable silty clay loam about 2 inches thick. The subsoil is about 14 inches thick; it is dark brown and brown, friable very shaly silty clay loam. Below a depth of 16 inches is bedded fragmental shale. The beds are 1 to 4 inches thick. The shale is light red, strong brown, and pink.

Included with this soil in mapping are spots of Yunes soils with less than 40 percent slopes. Also included are a few small areas on tops of hills and along drainageways where the bedded shale is exposed. These soils and areas of shale make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is not suited to cultivated crops because it is very steep and shallow to bedded shale. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is low, about 700 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of managment. Logging roads, skid trails, and planting should be on the contour to help control erosion.

The use of logging equipment is restricted at times because the soils are slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used for construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIs.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area –the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops, pasture, and woodland and as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

More than 300,000 acres in the survey area was used for crops and pasture in 1967, according to the Conservation Needs Inventory. Of this total, more than 89,000 acres was in crops and almost 211,000 acres in pasture.

The potential of the soils of the San Juan Area for increased production of food is good. There is considerable reserve productive capacity that is not being used for crops or pasture at the present time. This potential productive capacity could be further increased by extending the latest crop production technology to all land suitable for cropland in the survey area. This soil survey can greatly facilitate the application of such technology.

Acreage in crops and pasture has gradually been decreasing as more land is used for urban development. This is especially true in the urban fringe areas near the San Juan metropolitan area. The use of this soil survey can help in making land use decisions that will influence the role of farming in prime land retention.

Soil erosion is the major soil problem of cropland and pastureland in the San Juan Area. Where the slope is more than 5 percent, erosion is a hazard. Aceitunas, Almirante, Rio Arriba, and Vega Alta soils, for example, have slopes of 5 to 12 percent.

The loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plowed layer. Loss of the surface layer is especially damaging on soils with a clayey subsoil such as the Lares, Mabi, and Montegrande soils. Erosion also reduces productivity on soils that tend to be droughty such as the Catano, Durados, Estacion, and Reilly soils. Second, soil erosion on farmland results in sediment entering streams and lakes. Control of erosion minimizes the pollution of streams by sediment and improves quality of water for human use, for recreation, and for fish and wildlife.

In many sloping fields, preparing a good seedbed and tilling are difficult on clayey spots, because the original, friable surface layer has been eroded away. Such spots are common in moderately eroded areas of Almirante and Vega Alta soils.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms, which require pasture and cut grasses, the legume and grass forage crops reduce erosion on sloping land and also provide nitrogen and improve tilth.

Contour tillage or terracing is practical on soils that have long and regular slopes. On soils with short and irregular slopes, cropping systems that provide substantial vegetative cover are required to control erosion unless minimum tillage is practiced. Minimizing tillage and leaving crop residue on the surface help to increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the survey area. No tillage for row crops is effective in reducing erosion on sloping land and can be adapted to many soils with loamy surface layers, but is more difficult to practice successfully on soils with a clayey surface layer.

Diversions, terraces, and hillside ditches (fig. 12) reduce the length of slope and reduce runoff and erosion. They are more practical on deep, well drained soils that have regular slopes.

Information for the design of erosion control practices for each kind of soil is contained in the Technical Guide, available in the local offices of the Soil Conservation Service.

Soil drainage is the major management practice in some soils of the San Juan Area which are used for crops and pastures. Some soils are naturally so wet that the production of crops common to the area is not generally possible. These are the very poorly drained Hydraquents, Martin Pena, and Saladar soils.

Unless artificially drained, some poorly drained and somewhat poorly drained soils are so wet that crops are damaged during most years when the seasonal water table is high. In this category are the Bajura, Sabana Seca, and Vega Baja soils.

Soils such as the Coloso, Mabi, and Montegrande require less intensive drainage systems for sustained production.

The design of drainage systems varies with the kind of soil. A combination of surface and subsurface drainage is needed for the poorly drained soils for intensive row cropping. Drains have to be more closely spaced in soils with slow permeability than in permeable soils. Finding adequate outlets for drainage systems is difficult in some areas of the Bajura, Sabana Seca, and Vega Baja soils. Information on drainage design for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil fertility is naturally low in most soils of the coastal plains of the survey area. These soils are very strongly acid and leached. Unless limed and fertilized, Aceitunas, Almirante, Bayamon, Lares, Torres, and Vega Alta soils have low to moderate productivity. The soils on the flood plains, such as the Toa, Bajura, and Coloso, range from neutral to slightly acid and are naturally higher in plant nutrients.

Some soils of the uplands such as Aibonito, Consumo, Daguey, Humatas, Limones, and Los Guineos are steep and very strongly acid, and the fertility is naturally low. They require applications of lime and fertilizer.

Others, such as Juncos, Morado, and Mucara soils, are slightly acid and are naturally higher in plant nutrients.

On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Many of the soils of the survey area have moderate amounts of organic matter in the surface layer. Generally the structure is moderate granular, and physical condition is good. However, if the erosion is moderate or severe, the subsoil, which is clayey, is exposed. The subsoil reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help to improve soil structure and reduce erosion.

Crops suited to the soils and climate of the San Juan Area and grown commercially are plantains, bananas, taniers, yams, sweet potatoes, tobacco, and fruit orchards.

There is high potential for the production of sugarcane in the San Juan Area.

Special crops, such as tomatoes, green peppers, cabbage, oranges, grapefruits, limes, chironjas and West Indian cherries, have high potential in the area. There is also a high potential for ornamental plants and shrubs in the uplands and in the coastal plains of the area.

The best adapted species for pasture are stargrass and pangolagrass and, to some extent, guineagrass.

Commercial plantings of rice are feasible in the somewhat poorly drained and poorly drained soils of the flood plains such as the Coloso and Bajura soils.

Coffee, both sun and shade varieties, does very well in the cooler uplands of the San Juan Area.

Latest information and suggestions for growing these crops can be obtained from the local offices of the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby areas were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 6. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

Woodland

When Puerto Rico was colonized in the early 1500's, the island was completely covered by forests, but land clearing for farms was soon begun. By 1880 most of the forests had been cut. Some areas were unsuitable for permanent cultivation and were abandoned when their fertility was lost. Later, some of these areas were again cleared, cultivated, and abandoned. Land thus abandoned generally was taken over by inferior volunteer trees.

According to the 1967 Conservation Needs Inventory, there was a total of 72,239 acres of woodland: 11,637 acres of commercial forests and 60,602 of noncommercial forests. The total forested acreage is about 16 percent of the San Juan Area.

Forest is an excellent use of the soils of the San Juan Area for the protection of soil and water resources. Forest cover can minimize floods, reduce the amount of soil material lost as sediment in rivers, and hold runoff into periods of dry weather. Some natural noncommercial forests should be converted to commercial. Others should be protected and left in their natural state. Trees should be planted in some nonforested areas.

Species having the best potential for the San Juan area are Honduras pine, Honduras mahogany, kadam, teak, and eucalyptus.

Woodland management and productivity

Table 7 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Mapping unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as the average yearly growth in board feet per acre. The trees listed are not native, but appear to be those best suited to the soil. The figures for average yearly growth are estimates. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, and open ditches. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings without basements and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding,

slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils sur-

rounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 13 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 13.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plant..fe. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; suscepti-

bility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features.

Engineering properties

Table 13 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 13 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 13 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 13. Also in table 13 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

The estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 14 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field

checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Table 15 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Subsidence is the settlement of organic soils or of soils containing semifluid layers. Initial subsidence generally results from drainage. Total subsidence is initial subsidence plus the slow sinking that occurs over a period of several years as a result of the oxidation or compression of organic material.

Classification of soils

This section describes the soil series of the survey area, defines the current system of classifying soils, and classifies the soils of the area according to that system.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*3*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil maps for detailed planning."

Aceitunas series

The Aceitunas series consists of clayey, oxidic, isohyperthermic Typic Palehumults. These soils are deep, well drained, and have a B2 horizon of yellowish red clay. They formed in fine textured sediments washed from limestone. The Aceitunas soils are on alluvial fans and in valleys. Slopes range from 2 to 12 percent, but are dominantly 5 to 12 percent. The mean annual precipitation is 66 inches, and the mean annual temperature is 77 degrees F.

The Aceitunas soils are associated with the Via, Rio Arriba, and Mabi soils, but the clayey subsoil is not so expansive as that of those soils.

Typical pedon of Aceitunas clay, 5 to 12 percent slopes, 0.8 kilometer south of intersection of Highway 250 and Highway 1, then 25 feet west in a pangolagrass field.

Ap—0 to 8 inches, dark brown (7.5YR 4/4) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; few fine dark concretions; few fine pores; few krotovinas; very strongly acid; clear smooth boundary.

B21t—8 to 15 inches, yellowish red (5YR 4/6) clay; moderate fine subangular blocky structure; firm, slightly sticky, slightly plastic; many fine roots; common dead dark roots; few krotovinas; few fine pores; very strongly acid; gradual smooth boundary.

B22t—15 to 30 inches, yellowish red (5YR 4/8) clay; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; common dead roots; common patchy clay films; few pores; few fine roots; few fine weathered rock fragments; very strongly acid; gradual smooth boundary.

B23t—30 to 43 inches, yellowish red (5YR 4/8) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few dead roots; few pores; few weathered rock fragments; few patchy clay films on ped surfaces; very strongly acid; gradual smooth boundary.

B24t—43 to 60 inches, yellowish red (5YR 4/8) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine dark stains; patchy clay films, very strongly acid.

The solum is more than 60 inches thick. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 3 or 4.

The B2t horizon has hue of 5YR and 2.5YR, value of 4 to 6, and chroma of 6 to 8. It has weak to moderate fine and medium subangular blocky structure.

Aibonito series

The Aibonito series consists of clayey, oxidic, isohyperthermic Orthoxic Tropohumults. These soils are deep, well drained, and have a B2 horizon of strong brown clay. They formed in residuum of volcanic rocks. The Aibonito soils are on side slopes and ridgetops of volcanic uplands. Slopes range from 12 to 40 percent, but are dominantly 20 to 40 percent. The mean annual precipitation is 90 inches, and the mean annual temperature is 75 degrees F.

The Aibonito soils are associated with the Catalina, Comerio, and Mucara soils. They have a thinner solum than the Catalina and Comerio soils and a thicker solum than the Mucara soils.

Typical pedon of Aibonito clay, 20 to 40 percent slopes, 5 feet east from kilometer 6.2 of Highway 162, Aibonito, P.R.

Ap—0 to 7 inches, dark grayish brown (10YR 4/2) clay; moderate fine subangular blocky structure; very hard, friable, slightly sticky, plastic; many fine roots; very strongly acid; abrupt irregular boundary.

B1—7 to 11 inches, strong brown (7.5YR 5/6) clay; common fine distinct yellowish red (5YR 4/6) mottles in ped interiors and brown (10YR 4/3) coatings on ped surfaces; extremely firm, sticky, plastic; few

fine roots restricted to the ped surfaces; few sand size grains; extremely acid; gradual wavy boundary.

B21t—11 to 22 inches, strong brown (7.5YR 5/6) clay; common fine distinct yellowish red (5YR 4/6) mottles and brown (10YR 4/3) coatings on surfaces of peds; strong coarse prismatic parting to moderate medium subangular blocky structure; extremely firm, sticky, plastic; few fine roots restricted to surfaces of peds; few sand size grains; extremely acid; gradual wavy boundary.

B22t—22 to 32 inches, strong brown (7.5YR 5/6) clay; common fine distinct red (2.5YR 5/6) mottles; strong coarse prismatic structure parting to moderate medium subangular blocky; brown (10YR 4/3) coatings on ped surfaces; extremely firm, sticky, plastic; few fine roots; few sand size grains; extremely acid; gradual wavy boundary.

B3—32 to 43 inches, strong brown (7.5YR 5/6) clay; many medium prominent yellowish brown (10YR 5/6) and red (2.5YR 4/6) mottles, and few medium prominent white (10YR 8/1) mottles; weak medium subangular blocky structure; thin patchy clay films; friable, slightly sticky, plastic; very few fine roots; extremely acid; gradual wavy boundary; 30 percent of this horizon is saprolite.

C1 43 to 65 inches, variegated red (2.5YR 4/6), strong brown (7.5YR 5/6), and white (10YR 8/1) clay saprolite; massive; friable, slightly sticky, plastic; extremely acid; gradual wavy boundary.

C2—65 to 110 inches, variegated red (2.5YR 4/6), strong brown (7.5YR 5/6), and white (10YR 8/1) silty clay saprolite; massive; friable, slightly sticky, slightly plastic; extremely acid. Rock structure is visible. Material can be easily crushed with fingers.

The solum is 33 to 56 inches thick. Reaction throughout is very strongly acid or extremely acid.

The A horizon has hue of 10YR and 7.5YR, value of 4, and chroma of 2 to 4.

The B2 horizon has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 6 to 8.

The C horizons are clay and silty clay.

Almirante series

The Almirante series consists of clayey, oxidic, isohyperthermic Plinthic Paleudults. These soils are deep, are well drained, and have a B2 horizon of strong brown and brownish yellow clay underlain by plinthite layers. They formed in fine textured sediments of mixed origin. The Almirante soils are on coastal plains and in valleys between the limestone hills. Slopes range from 2 to 12 percent, but are dominantly 2 to 5 percent. The mean annual precipitation is 65 inches, and the mean annual temperature is 78 degrees F.

The Almirante soils are associated with the Bayamon, Matanzas, Tanama, and Vega Alta soils. They have a thicker solum than the Matanzas and the Tanama soils. They have plinthite which the Bayamon soils lack. They are deeper over the plinthite than the Vega Alta soils.

Typical pedon of Almirante clay, 2 to 5 percent slopes, 1 kilometer from intersection of Highway 693 and 694, then 40 feet north, Dorado, P.R.

Ap—0 to 7 inches, dark yellowish brown (10YR 4/4) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; many quartz grains; many fine dark concretions; very strongly acid; clear smooth boundary.

B21t—7 to 34 inches, strong brown (7.5YR 5/6) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few patchy clay films; many quartz grains; common black stains; common fine roots; few fine pores; very strongly acid; clear smooth boundary.

B22t—34 to 46 inches, brownish yellow (10YR 6/8) and dark red (10R 3/6) clay; weak medium subangular blocky structure; firm, sticky, plastic; dark concretions; purple stains; few fine rock fragments; about 8 percent by volume is plinthite; very strongly acid; gradual smooth boundary.

B23t—46 to 60 inches, variegated brownish yellow (10YR 6/8), dark red (10R 3/6), and light gray (5Y 7/1) clay; weak medium subangular blocky structure; firm, sticky, plastic; about 15 percent by volume is plinthite; very strongly acid.

The solum is more than 60 inches thick. Reaction throughout is very strongly acid.

The A horizon has hue of 10YR, 7.5YR, or 5YR; value of 3 or 4; and chroma of 2 to 4.

The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 4 to 8. It has a weak to moderate fine to medium subangular blocky structure.

Bajura series

The Bajura series consists of fine, mixed, nonacid isohyperthermic Vertic Tropaquepts. These soils are deep, are poorly drained, and have a B horizon of dark gray clay. They formed in fine textured sediments of mixed origin. The Bajura soils are on river flood plains. Slopes range from 0 to 2 percent. The mean annual precipitation is 84 inches, and the mean annual temperature is 78 degrees F.

The Bajura soils are associated with the Coloso, Toa, and Dique soils. They have more expansive clays than the Coloso soils. They are finer textured than the Toa and the Dique soils.

Typical pedon of Bajura clay, 0.2 miles east, 0.2 miles north, and 25 feet east from kilometer 18.4 of Highway 165.

Ap 0 to 5 inches, dark brown (10YR 3/3) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; few dead roots; few krotovinas; few root channels; few fine pebbles; medium acid; gradual smooth boundary.

B—5 to 12 inches, dark gray (10YR 4/1) clay; mottles are common medium distinct yellowish brown (10YR 5/6), few medium distinct very dark gray (5Y 3/1), and few fine brown to dark brown (7.5YR 4/4); weak coarse subangular blocky structure; firm, slightly sticky, plastic; few pressure faces; few fine roots; few dead roots; few fine pebbles; medium acid; gradual smooth boundary.

C1g—12 to 31 inches, gray to light gray (5Y 6/1) and yellowish brown (10YR 5/6) clay; few fine greenish gray (5G 6/1) mottles; weak coarse subangular blocky structure; firm, sticky, plastic; few pebbles; few dead roots; slightly acid; gradual smooth boundary.

C2g—31 to 38 inches, greenish gray (5G 6/1) clay; many medium distinct brownish yellow (10YR 6/6) and few medium distinct bluish gray (5B 5/1) mottles; weak coarse subangular blocky structure; firm, sticky, plastic; neutral; gradual smooth boundary.

C3g—38 to 60 inches, greenish gray (5GY 6/1) clay; with common medium prominent bluish gray (5B 5/1) and common medium distinct olive brown (2.5Y 4/4) mottles; massive; firm, very sticky, very plastic; few dead roots; few soft black concretions; neutral.

The solum is 12 to 20 inches thick. Reaction is medium acid to slightly acid.

The A horizon has hue of 10YR and 2.5Y, value of 2 or 3, and chroma of 3 or less. It has moderate medium subangular blocky structure.

Bayamon series

The Bayamon series consists of clayey, oxidic, isohyperthermic Typic Haplorthox. These soils are deep, are well drained, and have a B horizon of red clay. They

formed in fine textured sediments of mixed origin. The Bayamon soils are on stable coastal plains and in valleys between limestone hills. Slopes range from 2 to 5 percent. The mean annual precipitation is 65 inches, and the mean annual temperature is 78 degrees F.

The Bayamon soils are associated with the Almirante, Matanzas, and Vega Alta soils. They have a thicker solum than the Matanzas and Vega Alta soils. They lack the plinthic horizons of the Almirante and Vega Alta soils.

Typical pedon of Bayamon clay, 2 to 5 percent slopes, 80 feet east of shed and 50 feet north of junction of dirt roads, 0.4 miles west from farm entrance on dirt road. A.S.A. farm at Finca Monterrey, Bo. Higuillar, Dorado, P.R.

Ap—0 to 8 inches, dark reddish brown (2.5YR 3/4) clay; moderate fine granular structure; friable, slightly sticky, slightly plastic; common fine roots; few fine iron concretions; common fine sand size quartz grains; very strongly acid; clear smooth boundary.

B21—8 to 27 inches, weak red (10R 4/4) clay; weak coarse subangular blocky structure parting to moderate fine angular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; few fine oxide concretions; common fine quartz grains; common fine pores; black coatings on old root channels; very strongly acid; gradual smooth boundary.

B22—27 to 42 inches, red (10R 4/6) clay; massive in place, parting to weak very fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine pores; few fine sand size quartz grains; few fine black specks; very strongly acid; gradual smooth boundary.

B23—42 to 66 inches, red (10R 4/6) clay; massive in place, parting to weak very fine subangular blocky structure; very friable, slightly sticky, slightly plastic; few sand size quartz grains; few very fine black specks; few fine pores; yellow waxy coatings on ped surfaces and root channels; very strongly acid.

The solum is more than 60 inches thick. Reaction is very strongly acid.

The A horizon has hue of 5YR, 2.5YR, or 10R; value of 3 or 4; and chroma of 3 or 4.

The B2 horizon has hue of 2.5YR or 10R, value of 4 to 6, and chroma of 3 to 8. It is massive or has weak coarse and medium subangular blocky structure which parts readily into weak and moderate fine and medium angular and subangular blocky structure.

Caguabo series

The Caguabo series consists of loamy-skeletal, mixed, isohyperthermic Lithic Eutropepts. These soils are shallow, are well drained, and have an AC horizon of brown very gravelly clay loam. They formed in residuum of volcanic rocks. The Caguabo soils are on side slopes and ridgetops of strongly dissected uplands. Slopes range from 20 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 76 degrees F.

The Caguabo soils are associated with the Mucara, Morado, and Sabana soils. They have a thinner solum than the Mucara and Morado soils. They are less acid than the Sabana soils.

Typical pedon of Caguabo clay loam, 20 to 40 percent slopes, 300 feet east and 400 feet south of the tobacco drying barn which is approximately 1000 feet west of station headquarters, Gurabo Experiment Station.

Ap—0 to 4 inches, dark grayish brown (10YR 4/2) clay loam; weak fine granular structure; slightly hard, friable, nonsticky, slightly plastic; common fine volcanic rock fragments, common fine roots; slightly acid; clear smooth boundary.

AC—4 to 10 inches, brown (10YR 4/3) very gravelly clay loam; massive in place, parting to weak fine granular structure; friable, slightly sticky, slightly plastic; more than 50 percent by volume fine volcanic fragments; few fine roots; slightly acid; clear smooth boundary.

C—10 to 16 inches, mixture of weathered and partially weathered volcanic rock fragments that can be penetrated by spade.

R—16 inches, consolidated rock.

The solum is 8 to 16 inches thick. Reaction throughout is slightly acid.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 to 4.

The AC horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4.

Candelero series

The Candelero series consists of fine-loamy, mixed, isohyperthermic Aeric Tropaqualfs. These soils are deep, are somewhat poorly drained, and have a B2g horizon of dark gray or very dark gray sandy clay loam. They formed in moderately fine textured sediments high in quartz, feldspar, and hornblende minerals derived from granitic rocks.

The Candelero soils are on terraces, alluvial fans, and foot slopes. Slopes range from 2 to 5 percent. The mean annual precipitation is 87 inches, and the mean annual temperature is 77 degrees F.

The Candelero soils are associated with the Humacao and Cayagua soils. They have a thicker solum than the Humacao and Cayagua soils.

Typical pedon of Candelero loam, 0.1 mile northeast from kilometer 0.6 of Highway 183, then 450 feet northwest from a farm road, San Lorenzo, P.R.

Ap—0 to 6 inches, dark grayish brown (10YR 4/2) loam; few fine dark gray (10YR 4/1) mottles; weak fine subangular blocky structure parting to granular; friable; nonsticky, slightly plastic; common fine roots; common fine quartz grains; common fine black concretions; very strongly acid; clear smooth boundary.

B1—6 to 11 inches, dark brown (10YR 4/3) and dark gray (10YR 4/1), sandy clay loam; few fine yellowish red (5YR 4/6) and dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; common fine roots; many fine quartz crystals; common fine black concretions; very strongly acid; clear smooth boundary.

B21tg—11 to 20 inches, dark gray (10YR 4/1) sandy clay loam; many medium distinct yellowish brown (10YR 5/8) and few fine faint gray (N 5/0) mottles; weak medium and coarse subangular blocky structure; firm, slightly sticky, plastic; few fine roots; many quartz grains; common soft black concretions; strongly acid; gradual smooth boundary.

B22tg—20 to 35 inches, very dark gray (10YR 3/1) sandy clay loam; common medium distinct greenish gray (5GY 6/1) and brownish yellow (10YR 6/6) mottles; massive; firm, slightly sticky, plastic; few fine roots; many quartz grains; few fine dark minerals; common dark minerals; common dark stains due to dead roots; strongly acid; gradual smooth boundary.

B31g—35 to 49 inches, brownish yellow (10YR 6/8) sandy clay; mottles are common medium distinct dark gray (5Y 4/1) and few fine greenish gray (5G 5/1) and light brownish gray (10YR 6/2); massive; firm, slightly sticky, plastic; few fine quartz grains; few dark soft concretions; few dark stains; medium acid; gradual smooth boundary.

B32g—49 to 60 inches, yellowish brown (10YR 5/4) sandy clay; mottles are many fine distinct gray (5Y 6/1) and few fine yellowish red (5YR 4/6) and dark reddish brown (2.5YR 3/4); firm, slightly sticky,

plastic; few fine quartz grains; few sand lenses; few soft black concretions; medium acid.

The solum is more than 60 inches thick. Reaction throughout is medium acid to very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The B2t horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. It has weak medium and coarse subangular blocky structure or is massive.

Catalina series

The Catalina series consists of clayey, oxidic, isohyperthermic Tropeptic Haplorthox. These soils are deep, are well drained, and have a B2 horizon of dark reddish brown and reddish brown clay. They formed in fine textured residuum of volcanic rocks. The Catalina soils are on side slopes and hilltops. Slopes range from 4 to 12 percent. The mean annual precipitation is 85 inches, and the mean annual temperature is 75 degrees F.

The Catalina soils are associated with the Humatas, Daguey, and Consumo soils. They have a thicker solum than the Daguey soils and have a thicker B2 horizon than the Humatas and Consumo soils.

Typical pedon of Catalina clay, 4 to 12 percent slopes, 45 feet east of field road and 470 feet south of house at kilometer 8.8 of Highway 152, Barranquitas, P.R.

Ap—0 to 6 inches, dark reddish brown (5YR 3/3) clay, few fine distinct reddish brown (2.5YR 4/4) pockets; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; many sand size particles; few fine pieces of charcoal; medium acid; abrupt smooth boundary.

B21—6 to 20 inches, dark reddish brown (2.5YR 3/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; common fine pores; many soft black sand size particles; very strongly acid; clear smooth boundary.

B22—20 to 34 inches, reddish brown (2.5YR 5/4) clay; few reddish brown (2.5YR 4/4) ped faces; weak fine subangular blocky structure; firm, slightly sticky, plastic; few fine roots; few fine pores; few fine sand size particles; few pressure faces; very strongly acid; clear smooth boundary.

B23—34 to 84 inches, dark reddish brown (2.5YR 3/4) clay; weak fine angular blocky structure; firm, slightly sticky, plastic; few fine pores; common pressure faces; strongly acid; gradual wavy boundary.

B24 84 to 99 inches, variegated dusky red (10R 3/4), dark reddish brown (2.5YR 3/4), and strong brown (7.5YR 5/8) clay; few dark gray and white splotches; massive; firm, plastic; very strongly acid.

The solum is more than 60 inches thick. Reaction throughout is medium acid to very strongly acid.

The A horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 or 4.

The B2 horizon has hue of 2.5YR or 10R, value of 3 or 4, and chroma of 4 to 8. It has weak to moderate fine or medium subangular blocky structure or is massive.

Catano series

The Catano series consists of carbonatic, isohyperthermic Typic Troposamments. These soils are deep and excessively drained. They have A horizons of very dark brown sand and C horizons of dark brown and dark grayish brown sand. They formed in quartz sand, shell fragments, and miscellaneous volcanic rocks. The Catano soils are on coastal plains adjacent to the sea. Slopes range from 0 to 2 percent. The mean annual precipitation is 76 inches, and the mean annual temperature is 78 degrees F.

The Catano soils are associated with the Durados soils. They are coarser textured than the Durados soils.

Typical pedon of Catano loamy sand, 50 feet north of electrical transformers on east end of Punta Salinas, Catano, P.R.

A—0 to 7 inches, very dark grayish brown (10YR 3/2) loamy sand; single grain; loose, nonsticky, nonplastic; many fine roots; violent effervescence; clear smooth boundary.

AC—7 to 23 inches, dark brown (10YR 4/3) sand; single grain; loose; nonsticky, nonplastic; common fine roots; violent effervescence; clear smooth boundary.

C—23 to 58 inches; dark grayish brown (10YR 4/2) sand; single grain; loose, nonsticky, nonplastic; many fine shell fragments; violent effervescence.

Effervescence with dilute HCL ranges from slight to violent.

The A horizon has hue of 10YR and value and chroma of 2 or 3.

Cayagua series

The Cayagua series consists of fine, mixed, isohyperthermic Aeric Tropaqualfs. These soils are deep, are somewhat poorly drained, and have a B2tg horizon of light olive gray clay. They formed in residuum of coarse textured plutonic rocks. The Cayagua soils are on foot slopes and side slopes. Slopes range from 5 to 12 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Cayagua soils are associated with the Candelero and Humacao soils. They have a thinner solum than the Candelero soils and finer textured B horizons than the Humacao soils.

Typical pedon of Cayagua sandy loam, 70 feet north from kilometer 13.75 of Highway 183, San Lorenzo, P.R.

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) sandy loam; few fine dark gray (5Y 4/1) mottles; weak fine subangular blocky structure; friable, nonsticky, nonplastic; common fine roots; common fine quartz grains; few fine black concretions; very strongly acid; abrupt smooth boundary.

B21t—8 to 16 inches, yellowish brown (10YR 5/4) clay; mottles are common fine prominent dark gray (5Y 4/1), yellowish red (5YR 5/8), and red (2.5YR 4/8); firm, slightly sticky, plastic; few fine roots; few patchy clay films; common fine quartz grains; common dark stains in root channels; few soft black concretions; very strongly acid; clear smooth boundary.

B22tg—16 to 22 inches, light olive gray (5Y 6/2) clay; common fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) mottles; and few fine red (2.5YR 5/8) and greenish gray (5G 6/1) mottles; weak coarse subangular blocky structure; firm, slightly sticky, plastic; few fine roots; common fine quartz grains; few soft black concretions; very strongly acid; clear smooth boundary.

B3g—22 to 32 inches, light olive gray (5Y 6/2) sandy clay loam; common medium prominent yellowish brown (10YR 5/8) mottles, and few fine greenish gray (5BG 6/1) and light gray (2.5Y 7/2) mottles; massive; firm, slightly sticky, slightly plastic; common fine quartz grains; few soft black concretions; strongly acid; gradual smooth boundary.

C—32 to 43 inches, mixed yellowish brown (10YR 5/4 and 5/8), white (2.5Y 8/2), and gray (5Y 5/1) sandy clay loam saprolite; massive; friable, nonsticky, nonplastic; common fine quartz grains; common fine dark minerals; horizon consists of 80 percent saprolite; strongly acid.

The solum is 28 to 36 inches thick. Reaction throughout is very strongly acid to strongly acid.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3.

The B2 horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 2 to 4. It has weak coarse angular blocky structure.

The C horizons are sandy clay loam and sandy loam.

Colinas series

The Colinas series consists of fine-loamy, carbonatic, isohyperthermic Eutropeptic Rendolls. These soils are moderately deep to soft limestone, are well drained, and have a B horizon of brownish yellow clay loam. They formed in moderately fine textured residuum of limestone. The Colinas soils are on ridgetops and side slopes. Slopes range from 12 to 60 percent, but are dominantly 20 to 40 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 76 degrees F.

The Colinas soils are associated with the Soller and Tanama soils. They are underlain by softer limestone than that of the Soller or Tanama soils. They are yellower than the Tanama soils.

Typical pedon of Colinas clay loam, 40 to 60 percent slopes, eroded, 500 feet southeast of junction of Highways 820 and 823, Bo. Quebrada Arenas, Toa Alta, P.R.

A1—0 to 11 inches, dark brown (10YR 3/3) clay loam; moderate medium granular structure; friable, nonsticky, plastic; many fine roots; few limestone fragments; mildly alkaline; clear smooth boundary.

B—11 to 26 inches, brownish yellow (10YR 6/6) clay loam; weak medium subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; few limestone fragments; mildly alkaline; clear smooth boundary.

C1 26 to 48 inches, pale yellow (2.5Y 7/4) soft limestone crushing to silty clay loam; massive; very friable, nonsticky, slightly plastic; mildly alkaline.

C2—48 to 52 inches, mixture of yellow and white limestone containing common fine and medium limestone fragments.

The solum is 15 to 30 inches thick. Reaction throughout is mildly alkaline.

The A horizon has hue of 10YR, value of 3 to 6, and chroma of 2 or more.

The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or more.

The C horizon is clay loam or silty clay loam.

Coloso series

The Coloso series consists of fine, mixed, nonacid, isohyperthermic Aeric Tropic Fluvaquents. These soils are deep, are somewhat poorly drained, and have a C horizon of dark grayish brown, dark brown, and dark gray silty clay. They formed in fine textured and moderately fine textured alluvial sediments of mixed origin. The Coloso soils are on flood plains. Slopes range from 0 to 2 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Coloso soils are associated with the Bajura, Toa, and Dique soils. They are coarser textured and better drained than the Bajura soils, but finer textured and more poorly drained than the Toa and Dique soils.

Typical pedon of Coloso silty clay loam, 300 feet west of road and 400 feet north of the terrace break, which is approximately 2800 feet north of the Gurabo Experiment Station's headquarters.

Ap—0 to 7 inches, dark brown (10YR 3/3) silty clay loam; few fine distinct dark reddish brown (2.5YR 3/4) mottles; medium coarse granular structure; slightly hard, friable, nonsticky, slightly plastic; many roots; medium acid; clear smooth boundary.

C1—7 to 16 inches, mixed dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) silty clay loam; weak coarse subangular blocky structure; friable, nonsticky, slightly plastic; many roots; organic stains on ped surfaces; medium acid; clear smooth boundary.

C2g—16 to 32 inches, dark grayish brown (10YR 4/2) and light gray (10YR 6/1) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm, slightly sticky, plastic; black stains along fracture planes and in root channels, the light gray color is more concentrated in root channels and on fracture faces; many roots; medium acid; gradual smooth boundary.

C3g—32 to 55 inches, greenish gray (5G 5/1) silty clay; many medium distinct yellowish red (5YR 5/8) mottles; massive; firm, slightly sticky, plastic; common roots; medium acid; gradual smooth boundary.

C4g—55 to 70 inches, greenish gray (5G 5/1) silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm, slightly sticky, plastic; few roots; medium acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4.

The Cg horizon has hue of 10YR, 2.5Y, or 5G; value of 3 to 6; and chroma of 2 or less.

Consumo series

The Consumo series consists of clayey, mixed, isohyperthermic Dystropeptic Tropudults. These soils are deep, are well drained, and have a B2t horizon of yellowish red clay. They formed in residuum of basic volcanic rocks. The Consumo soils are on side slopes and narrow ridges of strongly dissected, humid uplands. Slopes range from 20 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 90 inches, and the mean annual temperature is 76 degrees F.

The Consumo soils are associated with the Daguey, Humatas, Morado, and Mucara soils. They are shallower to saprolite than the Daguey and Humatas soils. They are redder, are more acid, and have finer texture than the Morado and Mucara soils.

Typical pedon of Consumo clay, 40 to 60 percent slopes, 0.7 mile south from kilometer 48.1 of Highway 1, along farm road of La Mina de Oro Restaurant, then 20 feet south.

Ap—0 to 10 inches, reddish brown (5YR 4/4) clay; moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; few small subrounded rock fragments; very strongly acid; clear smooth boundary.

B2t—10 to 14 inches, yellowish red (5YR 5/6) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; thin patchy clay films; few fine pores; few small subrounded rock fragments; very strongly acid; clear smooth boundary.

B3—14 to 20 inches; yellowish red (5YR 5/6) clay; many medium distinct red (2.5YR 4/6) and common fine distinct brownish yellow (10YR 6/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; about 50 percent saprolite; very strongly acid; clear smooth boundary.

C—20 to 46 inches, variegated red (2.5YR 4/6 and 5/6), brownish yellow (10YR 6/6), and yellowish red (5YR 5/6), silty clay loam saprolite; massive; very friable, slightly sticky, slightly plastic; original rock structure visible; can be crushed with fingers; very strongly acid.

The solum is 14 to 24 inches thick. Reaction throughout is very strongly acid.

The A horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 4 to 6.

The B2 horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or more.

Corozal series

The Corozal series consists of clayey, mixed, isohyperthermic Aquic Tropudults. These soils are deep, are somewhat poorly drained, and have a B2 horizon of red clay. They formed in residuum of volcanic rocks. The sloping Corozal soils are on interfluves of strongly dissected low volcanic hills. Slopes range from 5 to 12 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 75 degrees F.

The Corozal soils are associated with the Consumo and Humatas soils. They have a thicker solum and are more poorly drained than the Consumo and Humatas soils.

Typical pedon of Corozal clay, 5 to 12 percent slopes, 3 miles southwest of the town of Corozal on the Corozal Experiment Station farm, 60 feet east of cattle weighing pen.

Ap—0 to 7 inches, dark reddish brown (5YR 3/4) clay; moderate fine subangular blocky structure; firm, slightly sticky, slightly plastic; many fine roots; very strongly acid; clear wavy boundary.

B1—7 to 9 inches, mixed dark red (2.5YR 3/6) and grayish brown (10YR 5/2) clay; moderate fine subangular blocky structure; firm, slightly sticky, plastic; thick continuous clay films; many fine roots; very strongly acid; clear wavy boundary.

B21t 9 to 13 inches, red (2.5YR 4/6) clay; reddish brown (5YR 4/4) on ped surfaces and root channels; moderate medium prismatic structure parting to moderate medium subangular blocky; firm, slightly sticky, plastic; thick continous clay films; many fine roots; very strongly acid; gradual wavy boundary.

B22t—13 to 24 inches, red (2.5YR 4/6) clay; yellowish brown (10YR 5/6) coatings on ped surfaces and in root channels; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin continuous clay films on ped faces and in root channels; common fine roots; very strongly acid; gradual wavy boundary.

B23t—24 to 32 inches, red (2.5YR 5/6) clay; yellowish brown (10YR 5/6) coatings on ped surfaces and in root channels; moderate medium subangular blocky structure parting to weak fine subangular blocky; friable, slightly sticky, slightly plastic; very few patchy clay films on vertical ped faces; few fine roots; very strongly acid; gradual wavy boundary.

B3—32 to 40 inches, yellowish red (5YR 5/6) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; very few patchy clay films on vertical ped faces; about 30 percent by volume is saprolite; pseudomorphs of feldspars easily crushed to shiny faces (kaolin books); very strongly acid; gradual irregular boundary.

C—40 to 60 inches; variegated yellowish red (5YR 5/6), light gray (5YR 7/1), and strong brown (7.5YR 5/6) clay loam saprolite; massive; friable, slightly sticky, slightly plastic; saprolite is easily crushed with fingers; rock structure visible; pseudomorphs of feldspars easily crushed to shiny faces (kaolin books); very strongly acid.

The solum is 40 to 50 inches thick. Reaction is very strongly acid.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4.

The B2 horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 to 8. It has strong to moderate subangular blocky structure or prismatic structure parting to subangular blocky.

Daguey series

The Daguey series consists of clayey, oxidic, isohyperthermic Orthoxic Tropohumults. These soils are deep, are well drained, and have a B horizon of reddish clay. They formed in the residuum of basic volcanic rocks. The Daguey soils are on the more stable side slopes, ridgetops, and foot slopes of the humid volcanic uplands. Slopes range from 2 to 20 percent, but are dominantly 12 to 20 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 78 degrees F.

The Daguey soils are associated with the Humatas and Consumo soils. The Daguey soils are more leached and have a thicker solum than the Humatas and Consumo soils.

Typical pedon of Daguey clay, 12 to 20 percent slopes, 40 feet west of Highway 813, then 80 feet south of road junction to house, Cibuco SCD, P.R.

Ap—0 to 10 inches, dark brown (7.5YR 4/4) clay; weak medium subangular blocky structure parting to moderate fine granular; firm, slightly sticky, slightly plastic; very strongly acid; abrupt wavy boundary.

B1—10 to 14 inches, reddish brown (5YR 5/4) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; clear smooth boundary.

B21t—14 to 23 inches, yellowish red (5YR 4/6) clay; few medium distinct yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure parting to moderate medium subangular and angular blocky; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; clear smooth boundary.

B22t—23 to 31 inches, red (2.5YR 4/6) clay; strong medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin continuous clay films on ped faces; very strongly acid; gradual smooth boundary.

B23t—31 to 43 inches, red (2.5YR 4/6) clay; strong medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; gradual smooth boundary.

B24t—43 to 59 inches, red (2.5YR 4/6) clay; moderate fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; gradual smooth boundary.

B3—59 to 72 inches, red (2.5YR 4/6) clay; weak medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; very thin patchy clay films; few small angular fragments of rock; very strongly acid; clear smooth boundary.

C1—72 to 86 inches, yellowish red (5YR 4/6) silty clay loam; common fine distinct strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; massive but with some evidence of original rock structure; friable, slightly sticky, slightly plastic; very strongly acid; gradual smooth boundary.

C2—86 to 90 inches, yellowish red (5YR 4/6) silty clay loam saprolite with well defined rock structure; common fine distinct strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; very strongly acid.

The solum is 50 to 80 inches thick. Reaction throughout is very strongly acid.

The A horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 2 to 4.

The B2 horizon has hue of 10R or 2.5YR, value of 4 or 5, and chroma of 6 to 8. It has moderate to strong medium and fine subangular blocky structure.

Descalabrado series

The Descalabrado series consists of clayey, mixed, isohyperthermic Lithic Vertic Ustropepts. These soils are shallow, are well drained, and have a B horizon of dark brown gravelly clay. They formed in residuum of basic volcanic rocks. The Descalabrado soils are on foot slopes, long and short side slopes, and ridgetops of semiarid volcanic uplands. Slopes range from 40 to 60 percent. The mean annual precipitation is 40 inches, and the mean annual temperature is 80 degrees F.

The Descalabrado soils are associated with the Guayama soils. The Descalabrado soils have colors with yellower hues and lack the argillic horizons of the Guayama soils.

Typical pedon of Descalabrado clay loam, 40 to 60 percent slopes, 1250 feet south from elementary school of Bo. Cercadillo, Cayey, P.R.

A1 0 to 5 inches, very dark grayish brown (10YR 3/2) clay loam; moderate fine granular structure; friable, nonsticky, slightly plastic, few fine roots; few fine pores; few rock fragments 2 millimeters to 25 millimeters in diameter; neutral; clear smooth boundary.

B 5 to 11 inches, dark brown (10YR 3/3) gravelly clay; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; few fine pores; 20 percent rock fragments 2 millimeters to 25 millimeters in diameter; neutral; clear smooth boundary.

C—11 to 17 inches, mixed dark yellowish brown (10YR 3/4 and 10YR 4/4) and olive (5Y 5/3) gravelly sandy clay loam weathered rock; massive; friable, nonsticky, slightly plastic; 25 percent rock fragments 1 to 3 inches in diameter; neutral; clear abrupt boundary.

R—17 inches, hard semiconsolidated volcanic rock.

The solum is 8 to 14 inches thick. Reaction throughout is neutral.

The A horizon has hue of 10YR and 7.5YR, value of 2 or 3, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4.

Dique series

The Dique series consists of fine-loamy, mixed, isohyperthermic Fluventic Eutropepts. These soils are deep, are well drained, and have a B2 horizon of dark yellowish brown loam. They formed in medium textured alluvial sediments of mixed origin. The Dique soils are on river flood plains. Slopes range from 0 to 2 percent. The mean annual precipitation is 72 inches, and the mean annual temperature is 77 degrees F.

The Dique soils are associated with the Toa, Bajura, Coloso, and Reilly soils. They are better drained and have coarser textures than the Bajura and Coloso soils. They are thicker and lack the gravelly layers of the Reilly soils. They are coarser textured and better drained than the Toa soils.

Typical pedon of Dique loam, 100 feet west from entrance of Gurabo Experiment Station, then 75 feet north of Highway 941.

Ap—0 to 6 inches, dark brown (10YR 4/3) loam; weak fine granular structure; friable, nonsticky, slightly plastic; many fine roots; medium acid; clear smooth boundary.

B1—6 to 16 inches, dark brown (10YR 4/3) loam; weak medium subangular blocky structure; friable, nonsticky, slightly plastic; common fine roots; few fine black concretions; medium acid; abrupt wavy boundary.

B2 -16 to 20 inches, dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; medium acid; gradual smooth boundary.

B3—20 to 36 inches, dark brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; medium acid; abrupt smooth boundary.

C—36 to 54 inches, dark yellowish brown (10YR 4/4) loam; friable, nonsticky, nonplastic; medium acid.

The solum is 20 to 40 inches thick. Reaction throughout is medium acid.

The A and B horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

Durados series

The Durados series consists of sandy, mixed, isohyperthermic Fluventic Hapludolls. These soils are deep, are excessively drained, and have dark grayish brown sandy loam Ap horizons over dark grayish brown loamy sand and sand C horizons. They formed in coarse textured materials which consist of sand size shell fragments and miscellaneous volcanic subrounded fragments. The Durados soils are on the coast at elevations close to sea level. Slope ranges from 0 to 2 percent. The mean annual precipitation is 70 inches, and the mean annual temperature is 80 degrees F.

The Durados soils are associated with the Coloso, Toa, and Catano soils. They are coarser textured and more permeable than the Coloso and Toa soils. They are finer textured than the Catano soils.

Typical pedon of Durados sandy loam, 0.2 mile northwest of kilometer 19.9, Highway 165, following a farm road, then 150 feet north.

Ap—0 to 14 inches, very dark grayish brown (10YR 3/2) sandy loam; massive; very friable, nonsticky, nonplastic; few fine roots; few medium coconut roots; few quartz grains; neutral; abrupt smooth boundary.

C1—14 to 23 inches, very dark grayish brown (10YR 3/2) loamy sand; single grain; loose; few fine cemented sandy concretions; neutral; abrupt smooth boundary.

C2—23 to 38 inches, very pale brown (10YR 7/3) and very dark grayish brown (10YR 3/2) sand; single grain; loose; about 25 percent of horizon is light gray (5Y 7/1) cemented sand that is strongly calcareous; moderately alkaline; abrupt smooth boundary.

C3—38 to 60 inches; sand that is mixed dark yellowish brown (10YR 4/4), black (10YR 2/1), brownish yellow (10YR 6/6), and yellowish brown (10YR 6/4); single grain; loose; this horizon has a thick layer of cemented sand that could be penetrated with an auger; few sea shells; common quartz grains; strongly alkaline, calcareous.

The mollic epipedon is 10 to 30 inches thick. Reaction throughout is neutral to strongly alkaline.

The A horizon has hue of 10YR or 7.5YR, value and chroma of 2 or 3.

Estacion series

The Estacion series consists of fine loamy over sandy or sandy-skeletal, mixed, isohyperthermic Fluventic Hapludolls. These soils are shallow, are well drained, and have an Ap horizon of dark brown silty clay loam and a C horizon of very dark grayish brown gravelly clay loam and sand. They formed in stratified moderately fine textured sediments over gravelly layers of mixed origin. The Estacion soils are on river flood plains. Slopes range from 0 to 2 percent. The mean annual precipitation is 70 inches, and the mean annual temperature is 80 degrees F.

The Estacion soils are associated with the Reilly, Toa, Coloso, Bajura, and Dique soils. They are finer textured in the upper horizons than the Reilly soils. They are coarser textured than the Bajura soils. They have gravelly subhorizons that the Toa, Coloso, and Dique soils lack.

Typical pedon of Estacion silty clay loam, 0.5 mile northwest from kilometer 32.8 of Highway 1, Caguas, P.R.

Ap—0 to 8 inches, dark brown (10YR 3/3) silty clay loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; few subrounded gravel 1/2 to 2 inches in diameter; medium acid; clear smooth boundary.

C1—8 to 20 inches, very dark grayish brown (10YR 3/2) gravelly clay loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; many fine and coarse gravel-size subrounded fragments; medium acid; gradual smooth boundary.

C2—20 to 50 inches; dark brown (10YR 4/3) gravelly sand; single grain; loose, nonsticky, nonplastic; about 50 percent coarse gravel; many rounded cobbles 3 to 7 inches in diameter; slightly acid.

Reaction throughout is slightly acid to medium acid.

The A horizon has hue of 10YR or 7.5YR, value of 3, and chroma of 2 or 3.

The C horizons are gravelly clay loam and gravelly sand.

Guayama series

The Guayama series consists of clayey, mixed, isohyperthermic Lithic Haplustalfs. These soils are shallow, are well drained, and have a B horizon of red gravelly clay. They formed in residuum of volcanic rocks. The Guayama soils are on side slopes and narrow ridgetops of dissected uplands. Slopes range from 20 to 60 percent. The mean annual precipitation is 35 inches, and the mean annual temperature is 80 degrees F.

The Guayama soils are associated with the Descalabrado soils. The Guayama soils have a redder B horizon than the Descalabrado soils.

Typical pedon of Guayama clay loam, 20 to 60 percent slopes, 0.5 mile west from Jajome Bajo School, then 25 feet north from dirt road, Cayey, P.R.

A—0 to 4 inches, dark reddish brown (5YR 3/4) clay loam; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; common angular rock fragments 1/8 to 1 inch in diameter; neutral; clear smooth boundary.

B—4 to 12 inches, red (2.5YR 4/6) gravelly clay; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; about 25 percent angular rock fragments 1/4 to 2 inches in diameter; neutral; clear smooth boundary.

C—12 to 20 inches, red (2.5YR 5/8) gravelly silty clay loam; massive; friable, slightly sticky, slightly plastic; horizon consists of about 60 percent light yellowish brown (2.5Y 6/4) saprolite; about 25 percent weathered rock fragments; neutral; clear smooth boundary.

R—20 inches; greenish colored consolidated volcanic rock.

The solum is 10 to 14 inches thick. Depth to consolidated rock is 20 inches or less. Reaction throughout is neutral to mildly alkaline.

The A horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 3 or 4.

The B horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 4 to 6.

Humacao series

The Humacao series consists of fine-loamy, mixed, isohyperthermic Fluventic Eutropepts. These soils are deep, are moderately well drained, and have a B horizon of dark yellowish brown sandy clay loam. They formed in medium and moderately fine textured sediments derived from plutonic rocks. The Humacao soils are on terraces above the river flood plains. Slopes range from 0 to 2 percent. The mean annual precipitation is 85 inches, and the mean annual temperature is 75 degrees F.

The Humacao soils are associated with the Candelero and Vivi soils. The Humacao soils have a thinner and coarser textured solum than the Candelero soils, but are finer textured throughout than the Vivi soils.

Typical pedon of Humacao loam, 0.4 mile west from kilometer 1.5 of Highway 912, then 18 feet north from rectangular cattle drinking tank, Bo. Cerro Gordo, San Lorenzo, P.R.

A—0 to 8 inches, dark brown (10YR 4/3) loam; weak fine granular structure; friable, nonsticky, nonplastic; many fine roots; common fine quartz grains; few dark minerals; strongly acid; clear smooth boundary.

B—8 to 15 inches, dark yellowish brown (10YR 4/4) sandy clay loam; weak fine subangular blocky structure; friable, nonsticky, nonplastic; few fine roots; common fine quartz grains; few dark concretions; strongly acid; clear smooth boundary.

C1—15 to 26 inches, brown (7.5YR 5/4) clay loam; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; common fine quartz grains; common fine dark minerals; few dark concretions; strongly acid; clear smooth boundary.

C2—26 to 44 inches, strong brown (7.5YR 5/6) clay loam; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; common fine quartz grains; common fine dark minerals; few dark concretions; strongly acid; clear smooth boundary.

C3 44 to 60 inches, redddish yellow (7.5YR 6/6) sandy clay loam; massive; very friable, nonsticky, nonplastic; many quartz grains; few dark minerals; strongly acid.

The solum is 13 to 24 inches thick. Reaction throughout is strongly acid to medium acid.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 2 or 3.

The B horizon has hue of 10YR or 5YR, value of 4 to 6, and chroma of 3 to 8.

The C horizons are clay loam and sandy clay loam.

Humatas series

The Humatas series consists of clayey, kaolinitic, isohyperthermic Typic Tropohumults. These soils are deep, are well drained, and have a B2 horizon of red clay. They formed in residuum of basic volcanic rocks. The Humatas soils are on narrow ridgetops and side slopes. Slopes range from 20 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 86 inches, and the mean annual temperature is 76 degrees F.

The Humatas soils are associated with the Catalina, Consumo, and Daguey soils. They have a thinner solum than the Catalina and Daguey soils and a thicker B2 horizon than the Consumo soils. They are also associated with the Naranjito soils, but are deeper than the Naranjito soils.

Typical pedon of Humatas clay, 40 to 60 percent slopes, 0.9 mile from kilometer 9.8 of Highway 765 and 200 feet northwest from dirt road, San Lorenzo, P.R.

Ap—0 to 5 inches, dark brown (7.5YR 4/4) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; few fine pores; few fine black concretions; few krotovinas; very strongly acid; clear smooth boundary.

B21t—5 to 14 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; friable, slightly sticky, plastic; few fine roots; few fine pores; few fine black concretions; common thin clay films on surfaces of peds and in pores; very strongly acid; clear smooth boundary.

B22t—14 to 24 inches, red (2.5YR 4/6) clay, few yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable, slightly sticky, plastic; few fine pores; common thin clay films on surfaces of peds and in pores; very strongly acid; gradual smooth boundary.

B3—24 to 34 inches, yellowish red (5YR 5/6) silty clay, few fine dark yellowish brown (10YR 4/4), red (10R 4/6), yellowish brown (10YR 5/6), and dusky red (2.5YR 3/4) mottles; weak fine and medium subangular blocky structure; friable, nonsticky, slightly plastic; few thin clay films; 2 percent weathered rock fragments; very strongly acid; clear smooth boundary.

C1 34 to 45 inches, red (10R 4/8), yellowish red (5YR 5/6), and strong brown (7.5YR 5/6) silty clay; massive; very friable, nonsticky, slightly plastic; few fine pores; 2 percent weathered rock fragments; 75 percent of horizon is saprolite; strongly acid; gradual smooth boundary.

C2—45 to 60 inches, dark red (10R 3/6), red (10R 4/6), reddish brown (5YR 5/4), olive yellow (2.5Y 6/8), and white (N 8/0) silty clay saprolite; massive; very friable, nonsticky, slightly plastic; few fine pores; 2 percent weathered rock fragments; strongly acid.

The solum is 23 to 41 inches thick. Reaction throughout is very strongly acid or strongly acid.

The A horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6.

The B2t horizon has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 3 to 6. It has weak to moderate fine and medium subangular blocky structure.

The C horizon is silty clay, clay, or clay loam.

Jagueyes series

The Jagueyes series consists of fine-loamy, mixed, isohyperthermic Orthoxic Tropudults. These soils are deep, are well drained, and have a B2t horizon of red clay loam. They formed in residuum of plutonic rocks. The Jagueyes soils are on side slopes and narrow ridgetops of humid uplands. Slopes range from 20 to 40 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 80 degrees F.

The Jagueyes soils are associated with the Lirios, Limones, and Pandura soils. The Jagueyes have thicker and redder B2 horizons than the Pandura soils. They are coarser textured than Limones soils and have a thicker solum than Lirios soils.

Typical pedon of Jagueyes loam, 20 to 40 percent slopes, eroded, 2.8 miles southeast of kilometer 11.4 of Highway 181, then 350 feet southwest from dirt road, then 50 feet west, San Lorenzo, P.R.

Ap—0 to 5 inches, dark yellowish brown (10YR 4/4) loam; few fine grayish brown (2.5Y 5/2) mottles; weak fine subangular blocky structure parting to granular; friable, nonsticky, nonplastic; few fine roots; common fine quartz grains; few fine black concretions; few krotovinas; very strongly acid; clear smooth boundary.

B21t—5 to 14 inches, yellowish red (5YR 4/6) and yellowish brown (10YR 5/6) clay loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine pores; few patchy clay films; common quartz grains; few fine black concretions; few krotovinas; very strongly acid; clear smooth boundary.

B22t—14 to 24 inches, red (2.5YR 4/6) clay loam; common medium distinct light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; few fine pores; common patchy clay films; common fine quartz grains; few dark concretions; very strongly acid; gradual smooth boundary.

B23t—24 to 41 inches; red (2.5YR 4/6) clay loam; few medium distinct light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine pores; common patchy clay films, many fine quartz grains; few black concretions; very strongly acid; gradual smooth boundary.

B3—41 to 54 inches, red (2.5YR 4/8) sandy clay loam; common medium distinct brownish yellow (10YR 6/6) and few medium distinct light gray (10YR 7/2) mottles; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; few fine pores; many fine quartz grains; few fine black minerals; very strongly acid; clear smooth boundary.

C—54 to 62 inches, yellowish red (5YR 5/8) sandy clay loam; mottles are many fine distinct pink (7.5YR 7/4), common fine distinct very pale brown (10YR 7/4), and few fine red (2.5YR 4/8); weak fine subangular blocky structure; friable, nonsticky, slightly plastic; many fine quartz grains; few fine black minerals; about 75 percent of horizon is saprolite; very strongly acid.

The solum is 48 to 60 inches thick. Reaction throughout is very strongly acid.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 2 to 4.

The B2t horizon has hue of 5YR or 2.5YR, value of 4 to 7, and chroma of 6 to 8. It has weak to moderate fine to medium subangular blocky structure.

Juncal series

The Juncal series consists of fine, mixed, isohyperthermic Typic Tropudalfs. These soils are deep, are moderately well drained, and have B2t horizons of dark yellowish brown, brownish yellow, and yellowish brown clay. They formed in residuum of limestone. The Juncal soils are on foot slopes and low rounded hills. Slopes range from 5 to 20 percent. The mean annual precipitation is 85 inches, and the mean annual temperature is 77 degrees F.

The Juncal soils are associated with the Colinas soils. They are thicker and have yellower and lighter colors than the Colinas soils.

Typical pedon of Juncal clay, 5 to 20 percent slopes, eroded, 1.9 kilometers south of junction of Highways 2 and 677, 2.5 kilometers east of junction of Highways 823 and 677, 1700 feet northeast of a dairy barn, 800 feet northeast of a farm pond, Barrio Rio Lajas, Toa Alta, P.R.

Ap—0 to 10 inches, dark grayish brown (10YR 4/2) clay; weak coarse subangular blocky structure; firm, slightly sticky, plastic; many fine roots; medium acid; clear wavy boundary.

B21t—10 to 14 inches, dark yellowish brown (10YR 4/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin patchy clay films; common fine roots; mildly alkaline; clear wavy boundary.

B22t—14 to 20 inches, yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin discontinuous patchy clay films; few fine roots; mildly alkaline; clear wavy boundary.

B23t—20 to 34 inches; brownish yellow (10YR 6/8) clay; common fine distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin patchy clay films; mildly alkaline; clear wavy boundary.

B24t—34 to 40 inches; brownish yellow (10YR 6/6) clay; few fine prominent yellowish red (5YR 5/6) and few fine prominent light greenish gray (5BG 7/1) mottles; moderate fine subangular blocky structure; firm, slightly sticky, plastic; thin patchy clay films, few fine roots; few black concretions; neutral; clear wavy boundary.

B25t—40 to 48 inches; yellowish brown (10YR 5/6) clay; few fine prominent red (2.5YR 5/6) mottles; moderate fine subangular blocky structure; firm, slightly sticky, plastic; thin patchy clay films; few roots; few black stains; neutral; clear wavy boundary.

C—48 to 60 inches, brownish yellow (10YR 6/8) silty clay loam; common fine faint light gray (10YR 7/2) mottles; friable, slightly sticky, plastic; there are lime splotches present in this horizon; about 40 percent of the horizon is soft limestone; mildly alkaline.

The solum is 36 to 58 inches thick. Reaction throughout ranges from medium acid to mildly alkaline.

The A horizon has hue of 7.5YR and 10YR, value of 4, and chroma of 2 or 3.

The B2t horizon has hue of 7.5YR and 10YR, value of 4 to 6, and chroma of 4 to 8. It has moderate fine to medium subangular blocky structure.

Juncos series

The Juncos series consists of fine, montmorillonitic, isohyperthermic Vertic Eutropepts. These soils are deep, are well drained, and have a B2 horizon of dark brown clay. They formed in residuum of basic volcanic rocks.

The Juncos soils are on side slopes and foot slopes of strongly dissected uplands. Slopes range from 5 to 20 percent, but are dominantly 12 to 20 percent. The mean annual precipitation is 66 inches, and the mean annual temperature is 77 degrees F.

The Juncos soils are associated with the Montegrande, Mabi, Mucara, and Caguabo soils. They have a thinner solum than the Montegrande and Mabi soils, but have a thicker solum than the Mucara and Caguabo soils.

Typical pedon of Juncos clay, 12 to 20 percent slopes, 800 feet north of the southwestern corner of the Gurabo Experiment Substation.

Ap—0 to 8 inches, black (10YR 2/1) clay; common fine distinct yellow (10YR 7/6) mottles; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky; plastic; many fine roots; few fine black concretions, slightly acid; clear smooth boundary.

B2—8 to 18 inches, dark brown (7.5YR 4/4) clay; small amount of Ap horizon mixed throughout; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky, plastic; common fine roots; few pressure faces; common fine black concretions; few subrounded volcanic fragments 1/4 to 1 inch in diameter; black coatings along root channels; neutral; clear smooth boundary.

C1—18 to 31 inches, olive brown (2.5Y 4/4) clay; massive; firm, slightly sticky, plastic; common fine roots; pressure faces and slickensides; many fine black concretions; black coatings on root channels; few subrounded volcanic fragments 1/4 to 1 inch in diameter; neutral; gradual smooth boundary.

C2—31 to 40 inches; olive brown (2.5Y 4/4) clay; massive with thin clay stringers between cleavage planes; firm, slightly sticky, slightly plastic; few roots; 15 percent by volume consists of weathered volcanic rocks; neutral; gradual wavy boundary.

R—40 inches; semiconsolidated volcanic rock.

The solum is 12 to 24 inches thick. Reaction throughout ranges from slightly acid to neutral.

The A horizon has hue of 10YR and 2.5Y, value of 2 or 3, and chroma of 1 or 2.

The B2 horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6.

Lares series

The Lares series consists of clayey, mixed, isohyperthermic Aquic Tropohumults. These soils are deep, are moderately well drained, and have a B2t horizon of yellowish red clay. They formed in fine textured material derived from volcanic rocks. The Lares soils are on dissected terraces and foot slopes. Slopes range from 2 to 12 percent, but are dominantly 5 to 12 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Lares soils are associated with the Daguey, Humatas, and Consumo soils. They are deeper to saprolite and are not so well drained as the Daguey, Humatas, and Consumo soils.

Typical pedon of Lares clay, 2 to 5 percent slopes, north of Urbanizacion Miraflores, 500 feet east of kilometer 3.0 of Highway 861, then 200 feet north along farm boundary.

Ap 0 to 6 inches, dark brown (10YR 4/3) clay; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; few fine black concretions; few krotovinas; few fine pores; few fine quartz grains; very strongly acid; abrupt smooth boundary.

B1—6 to 15 inches, red (2.5YR 4/8) clay; reddish brown (5YR 5/4) ped faces; few fine brownish yellow (10YR 6/6) mottles; moderate, medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; common fine pores; few fine krotovinas; common patchy clay films on ped surfaces and in pores; few fine concretions; few quartz grains; very strongly acid; clear smooth boundary.

B2t—15 to 22 inches, yellowish red (5YR 5/6) clay; common fine distinct pale red (10R 6/4) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; gradual smooth boundary.

B3—22 to 36 inches, yellowish red (5YR 5/8) clay; common medium distinct pale yellow (5Y 7/4); few fine distinct strong brown (7.5YR 5/8) and red (2.5YR 4/8) mottles and common fine distinct light gray (10YR 7/2) mottles; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots, few quartz grains; few fine pores; few patchy clay films; very strongly acid; gradual smooth boundary.

C1—36 to 52 inches; variegated brownish yellow (10YR 6/8), red (2.5YR 4/8), very pale brown (10YR 7/4), and dark yellowish brown (10YR 4/4) clay; weak fine subangular blocky structure; firm, nonsticky, slightly plastic; few fine quartz grains; few fine dark minerals; few fine pores; very strongly acid; gradual smooth boundary.

C2—52 to 60 inches, variegated brownish yellow (10YR 6/6), dark red (2.5YR 3/6), light gray (7.5YR 7/2), and red (2.5YR 4/8) clay; weak fine subangular blocky structure; firm, nonsticky, nonplastic; many quartz grains; few dark minerals; few fine pores; very strongly acid.

The solum is 26 to 53 inches thick. Reaction throughout is very strongly acid.

The A horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 3 or 4.

The B2t horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 4 or more.

Limones series

The Limones series consists of clayey, kaolinitic, isohyperthermic Epiaquic Orthoxic Tropohumults. These soils are deep, are moderately well drained, and have B2t horizons of yellowish brown and red clay. They formed in residuum of plutonic rocks. The Limones soils are on side slopes and narrow ridgetops of concordant remnants of highly dissected peneplains. Slopes range from 20 to 60 percent, but are dominantly 20 to 40 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Limones soils are associated with the Pandura, Jagueyes, and Lirios soils. They have a thicker solum than the Pandura and Lirios soils and are moderately well drained. They have a redder B2t horizon and are finer textured than the Jagueyes soils.

Typical pedon of Limones clay, 20 to 40 percent slopes, 1500 feet east from farm pond, 800 feet west from a dairy barn, 1700 feet west of the Quebrada Arenas school, 2100 feet east of the Cayaguas River and 1100 feet southwest of junction of Highway 912 and unnumbered road to the dairy barn.

Ap—0 to 7 inches, dark yellowish brown (10YR 4/4) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; few mottles caused by mixed A and B horizons during plowing; many quartz grains; few fine black concretions; very strongly acid; clear smooth boundary.

B1—7 to 18 inches, yellowish brown (10YR 5/4) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin patchy clay films; few quartz grains; very strongly acid; clear smooth boundary.

B21t—18 to 30 inches, yellowish brown (10YR 5/8) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin continuous clay films; common fine quartz grains; few fine dark grains; very strongly acid; clear smooth boundary.

B22t—30 to 41 inches, red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin continuous clay films; common fine quartz grains; few fine dark minerals; very strongly acid; gradual smooth boundary.

B3—41 to 48 inches, red (2.5YR 4/8) clay; common distinct reddish yellow (5YR 6/6); mottles; weak medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; thin patchy clay films; few fine quartz grains; very strongly acid; gradual smooth boundary.

C1—48 to 59 inches, red (2.5YR 4/6) clay; massive; friable; nonsticky, slightly plastic; few fine quartz grains; few dark minerals; about 30 percent of this horizon is saprolite; very strongly acid; gradual smooth boundary.

C2—59 to 79 inches, variegated red (2.5YR 5/8, 4/6, and 4/8) clay saprolite; massive; friable; nonsticky, nonplastic; many fine quartz grains; few dark minerals; very strongly acid.

The solum is 33 to 53 inches thick. Reaction throughout is very strongly acid.

The A horizon has hue of 10YR and 7.5YR, value of 4, and chroma of 2 to 4.

The B2t horizon has hue of 10YR or 2.5YR, value of 4 or 5, and chroma of 4 to 8.

Lirios series

The Lirios series consists of clayey over loamy, mixed, isohyperthermic Typic Tropudults. These soils are deep, are well drained, and have a B2t horizon of brown silty clay loam and a B3 horizon of red clay. They formed in residuum of plutonic rocks. The Lirios soils are on side slopes of the strongly dissected humid uplands. Slopes range from 20 to 60 percent. The mean annual precipitation is 85 inches, and the mean annual temperature is 77 degrees F.

The Lirios soils are associated with the Limones, Jagueyes, and Pandura soils. They have a thinner solum and are better drained than the Limones and Jagueyes soils. They are redder and overlie more highly weathered plutonic rocks than those of the Pandura soils.

Typical pedon of Lirios silty clay loam, 20 to 60 percent slopes, eroded, 2.7 miles west from kilometer 11.4 Highway 181, and 300 feet east from dirt road.

Ap 0 to 4 inches, brown (7.5YR 4/4) silty clay loam; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; common fine roots; common fine quartz grains; few krotovinas; very strongly acid; clear smooth boundary.

B2t—4 to 12 inches, brown (7.5YR 4/4) silty clay loam; weak fine subangular blocky structure; friable, slightly sticky, plastic; few fine roots; few fine pores; few patchy clay films on ped surfaces, common fine quartz grains; few fine dark minerals; very strongly acid; clear smooth boundary.

B3—12 to 24 inches, red (2.5YR 4/8) clay; common fine distinct light yellowish brown (2.5Y 6/4) and yellowish brown (10YR 5/4 and 5/6) mottles and few fine brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; friable, slightly sticky, plastic; few fine roots; few fine pores; few patchy clay films on ped surfaces; common fine quartz grains; few fine dark minerals; horizon is about 25 percent saprolite; very strongly acid; clear smooth boundary.

C1 –24 to 34 inches, variegated red (2.5YR 4/8), yellowish brown (10YR 5/8), yellowish red (5YR 5/8), very pale brown (10YR 7/3), brown (7.5YR 5/4), white (2.5Y 8/2), and red (10R 4/8) clay; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; common fine quartz grains; few fine dark minerals, few mica flakes; about 75 percent of this horizon is saprolite; very strongly acid; gradual smooth boundary.

C2 34 to 45 inches, variegated red (2.5YR 4/8), yellowish brown (10YR 5/8), yellowish red (5YR 5/8), very pale brown (10YR 7/3), brown (7.5YR 5/4), white (2.5Y 8/2), and red (10R 4/8) silty clay loam; massive; very friable, nonsticky, slightly plastic; many quartz grains; few dark minerals and mica flakes; very strongly acid; gradual smooth boundary.

C3—45 to 60 inches, variegated brownish yellow (10YR 6/8), yellow (10YR 7/8), red (10R 4/8), and very pale brown (10YR 7/4) silty clay loam; massive; very friable, nonsticky, slightly plastic; many fine dark minerals and quartz grains; structure of rock is more evident in this horizon; very strongly acid.

The solum is 20 to 24 inches thick. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4.

The B2t horizon has hue of 7.5YR, 5YR, and 2.5YR; value of 4 to 6; and chroma of 4 to 8.

The C horizon is silty clay loam and clay.

Los Guineos series

The Los Guineos series consists of clayey, mixed, isothermic Epiaquic Tropohumults. These soils are deep, are moderately well drained, and have a B2t horizon of yellowish brown and red clay. They formed in residuum of basic volcanic rocks. The Los Guineos soils are on side slopes and hilltops of humid volcanic uplands. Slopes

range from 20 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 95 inches, and the mean annual temperature is 70 degrees F.

The Los Guineos soils are associated with the Humatas, Consumo, Mucara, Naranjito, and Caguabo soils. They have a thicker solum and are less well drained than the Humatas, Consumo, Mucara, Naranjito, and Caguabo soils.

Typical pedon of Los Guineos clay, 20 to 40 percent slopes, 3.2 miles southeast of junction of Highway 1 and 184, along Highway 184 to Guavate and 40 feet north of highway.

Ap—0 to 4 inches, dark yellowish brown (10YR 4/4) clay; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; common fine roots; few fine black concretions; few krotovinas; very strongly acid; abrupt smooth boundary.

B21t—4 to 11 inches, yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm; slightly sticky, plastic; few fine pebbles; very strongly acid; clear smooth boundary.

B22t—11 to 19 inches, yellowish brown (10YR 5/6) clay with common fine prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; few fine pores; common patchy clay films on ped surfaces and in pores; very strongly acid; clear smooth boundary.

B23t—19 to 34 inches, red (2.5YR 4/8) and brownish yellow (10YR 6/6) clay; moderate medium subangular blocky structure parting to moderate fine subangular blocky; firm, slightly sticky, plastic; few fine pores; common patchy clay films on ped surfaces and in pores; very strongly acid; gradual smooth boundary.

B3—34 to 48 inches, red (10R 4/8) clay; mottles are common medium distinct red (2.5YR 4/8), common medium prominent brownish yellow (10YR 6/8), few medium prominent yellow (10YR 7/6), and few fine prominent white (10YR 8/2); weak medium subangular blocky structure parting to weak fine subangular blocky; firm, slightly sticky, plastic; few fine pores; few patchy clay films on ped surfaces and in pores; about 25 percent of horizon consists of saprolite; very strongly acid; gradual smooth boundary.

C—48 to 60 inches, red (10R 4/8) clay; mottles are many medium prominent brownish yellow (10YR 6/8), few medium prominent yellow (10YR 7/6), and few fine prominent white (10YR 8/2); weak fine subangular blocky structure; friable, slightly sticky, plastic; horizon consists of about 75 percent saprolite; very strongly acid.

The solum is 41 to 54 inches thick. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 3 to 5.

The B2t horizon has hue of 10YR and 7.5YR in the upper part and hue of 2.5YR and 10R in the lower part, value of 4 to 6, and chroma of 6 to 8.

Mabi series

The Mabi series consists of fine, montmorillonitic, isohyperthermic Vertic Eutropepts. These soils are deep, are somewhat poorly drained, and have a B2 horizon of yellowish brown clay. They formed in fine textured sediments derived from volcanic rocks. The Mabi soils are on alluvial fans and terraces above the river flood plains. Slopes range from 0 to 12 percent, but are dominantly 2 to 5 percent. The mean annual precipitation is 78 inches, and the mean annual temperature is 80 degrees F.

The Mabi soils are associated with the Montegrande, Rio Arriba, Juncos, and Mucara soils. They are clayey throughout and lack the gravelly subsurface layers of the Montegrande soils. They are darker colored than the Rio Arriba soils. They are not underlain by hard volcanic rocks as are the Juncos and Mucara soils.

Typical pedon of Mabi clay, 2 to 5 percent slopes, 800 feet north and 600 feet west of the Gurabo Experiment Substation Headquarters.

Ap—0 to 7 inches, very dark grayish brown (10YR 3/2) clay; few fine faint yellowish brown mottles; red (2.5YR 4/6) coatings along root channels; weak fine granular structure; hard, very firm, slightly sticky, plastic; common fine roots; common fine black nodules; few fine volcanic rock fragments; very strongly acid; clear smooth boundary.

B1—7 to 15 inches, dark yellowish brown (10YR 4/4) clay; few fine distinct gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; brown (10YR 4/3) when rubbed; weak fine and medium angular blocky structure with many pressure faces; very firm, slightly sticky, plastic; common fine roots; few fine black nodules; few fine volcanic rock fragments; strongly acid; clear wavy boundary.

B2—15 to 24 inches, yellowish brown (10YR 5/6) clay; many medium distinct gray (10YR 5/1) mottles; brown (10YR 4/3) when rubbed; weak fine and medium angular blocky structure with many pressure faces and slickensides that intersect; very firm, slightly sticky, plastic; few fine roots; few black nodules; few fine volcanic rock fragments; coatings along root channels; medium acid; clear wavy boundary.

C1—24 to 38 inches, yellowish brown (10YR 5/4) clay; few fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium and coarse angular blocky structure with many pressure faces and slickensides that intersect; very firm, slightly sticky, plastic; few fine black nodules; few fine volcanic rock fragments; few fine and medium carbonatic concretions; mildly alkaline; gradual smooth boundary.

C2—38 to 53 inches, yellowish brown (10YR 5/4) clay; common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with common pressure faces and slickensides; very firm, slightly sticky, plastic; few fine black nodules; few fine volcanic rock fragments; few fine and medium carbonatic concretions; mildly alkaline; gradual smooth boundary.

C3—53 to 67 inches, yellowish brown (10YR 5/4) clay; common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with few pressure faces and slickensides; very firm, slightly sticky, plastic; few fine black nodules; few fine and medium volcanic rock fragments; few fine carbonatic concretions; mildly alkaline; gradual wavy boundary.

The solum is 20 to 36 inches thick. Reaction throughout ranges from very strongly acid and medium acid in the upper horizons to mildly alkaline in the lower horizons.

The A horizon has hue of 10YR, value of 3 or less, and chroma of 2 or more.

The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6.

Malaya series

The Malaya series consists of clayey, mixed, isohyperthermic Lithic Eutropepts. These soils are shallow, are well drained, and have a B horizon of dark brown gravelly clay. They formed in residuum of volcanic rocks. The Malaya soils are on side slopes of strongly dissected uplands. Slopes range from 40 to 60 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 77 degrees F.

The Malaya soils are associated with the Mucara and Caguabo soils. They have a thinner solum than the Mucara soils and are more alkaline than the Caguabo soils.

Typical pedon of Malaya clay loam, 40 to 60 percent slopes, 100 meters south from kilometer 61.6 of Highway 1.

A1—0 to 6 inches, dark brown (10YR 3/3) clay loam; weak medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; few black concretions; about 10 percent by volume, fine and medium rock fragments; slightly acid; clear smooth boundary.

B—6 to 13 inches, dark brown (10YR 4/3) gravelly clay, weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine black concretions; about 20 percent by volume, fine and medium rock fragments; mildly alkaline; clear smooth boundary.

C—13 to 18 inches, dark yellowish brown (10YR 4/4) gravelly clay loam; massive; firm, slightly sticky, slightly plastic; black coatings on faces and on partially weathered rock fragments; about 20 percent by volume is rock fragments; moderately alkaline; gradual wavy boundary.

R—18 inches, semiconsolidated tuffaceous rocks.

The solum is 10 to 20 inches thick. Reaction throughout is slightly acid to moderately alkaline.

The A horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 3 or 4.

The B horizon has hue of 10YR, value of 4, and chroma of 3 or 4. It has weak medium to coarse subangular blocky structure.

The C horizon is gravelly clay loam. Depth to the consolidated volcanic rock is less than 20 inches.

Maricao series

The Maricao series consists of clayey, mixed, isothermic Dystropeptic Tropudults. These soils are deep, are well drained, and have a B2t horizon of red clay. They formed in residuum of basic volcanic rocks. The Maricao soils are on side slopes and narrow hilltops of strongly dissected humid uplands. Slopes range from 20 to 60 percent. The mean annual precipitation is 90 inches, and the mean annual temperature is 74 degrees F.

The Maricao soils are associated with the Los Guineos soils. They have a thinner B2t horizon than the Los Guineos soils.

Typical pedon of Maricao clay, 20 to 60 percent slopes, 300 feet east from kilometer 21.8 of Highway 157, then 50 feet south along farm boundary.

A—0 to 6 inches, reddish brown (5YR 5/4) clay; moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; very strongly acid; clear smooth boundary.

B2t—6 to 14 inches, red (2.5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; few patchy clay films; very strongly acid; clear smooth boundary.

B3—14 to 22 inches, red (2.5YR 5/6) silty clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; very strongly acid; clear smooth boundary.

C—22 to 60 inches, variegated red (2.5YR 4/6), strong brown (7.5YR 5/6 and 5/8), and pale brown (10YR 6/3) silty clay loam saprolite; massive; friable, slightly sticky, slightly plastic; very strongly acid.

The solum is 18 to 28 inches thick. Reaction throughout is very strongly acid.

The A horizon has hue of 2.5YR and 5YR, value of 4 or 5, and chroma of 4 or more.

The B2 horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or more.

Martin Pena series

The Martin Pena series consists of fine, mixed, nonacid, isohyperthermic Tropic Fluvaquents. These soils are deep, are very poorly drained, and have a black muck O horizon over silty clay loam and clay C horizons. They formed in organic materials from phanerogams such as reeds, sedges, and other water-loving grasses over fine textured sediments. The Martin Pena soils are in low depressional areas in the humid coastal plain and river flood plains. Slopes range from 0 to 2 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Martin Pena soils are associated with the Saladar, Bajura, and Coloso soils. They are underlain by mineral layers; whereas Saladar soils are organic throughout, and the Bajura and Coloso soils are mineral throughout.

Typical pedon of Martin Pena muck, 300 feet east of sentry box, entrance to the Sabana Seca Naval Communication Station, 30 feet north from center of paved unnumbered road.

Oa1—0 to 8 inches, black (10YR 2/1) muck; weak fine granular structure; slightly sticky, slightly plastic; many fine living and decayed roots; mildly alkaline; abrupt smooth boundary.

C1—8 to 18 inches, very dark brown (10YR 2/2) silty clay loam with thin lenses of brown to dark brown (10YR 4/3) organic materials; massive; slightly sticky, slightly plastic; few fine decayed roots; mildly alkaline; gradual smooth boundary.

C2 18 to 28 inches, very dark brown (10YR 2/2) clay; massive; slightly sticky, plastic; neutral; clear smooth boundary.

C3 28 to 55 inches, greenish gray (5G 5/1) clay; few fine faint very dark brown (10YR 2/2), dark greenish gray (5G 4/1), and greenish gray (5G 6/1) mottles; massive; slightly sticky, plastic; thin organic lenses; neutral; clear smooth boundary.

C4—55 to 63 inches, very dark brown (10YR 2/2) clay; few fine faint black (10YR 2/1) and greenish gray (5G 5/1) mottles; massive; slightly sticky, plastic; thin organic lenses; mildly alkaline.

The Oa1 horizon has hue of 10YR or 7.5YR, value of 2, and chroma of 2 or less.

The upper C horizon has hue of 10YR with value and chroma of 2 or 3. Thin organic lenses may occur in the lower C horizon. Reaction throughout the profile ranges from neutral to mildly alkaline.

Matanzas series

The Matanzas series consists of clayey, oxidic, isohyperthermic Tropeptic Eutrorthox. These soils are deep, are well drained, and have a B2 horizon of dark reddish brown and red clay. They formed in sediments derived from limestone. The Matanzas soils are on foot slopes and in small valleys between the limestone hills. Slopes range from 2 to 5 percent. The mean annual precipitation is 64 inches, and the mean annual temperature is 77 degrees F.

The Matanzas soils are associated with the Bayamon and Tanama soils. They have a thinner solum and are shallower to hard limestone than the Bayamon soils. They are redder and deeper to the hard limestone than the Tanama soils.

Typical pedon of Matanzas clay, 2 to 5 percent slopes, 60 feet south and 100 feet west of Maguayo school, Bo. Maguayo, Toa Baja, P.R.

Ap—0 to 7 inches, dark reddish brown (5YR 3/4) clay; weak fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; common fine roots; common fine quartz grains; common fine dark minerals; medium acid; clear smooth boundary.

B21—7 to 20 inches, dark reddish brown (2.5YR 3/4) clay; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common fine pores; common fine quartz grains; medium acid; gradual smooth boundary.

B22—20 to 32 inches, red (2.5YR 4/6) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common fine quartz grains; slightly acid; gradual smooth boundary.

B23—32 to 40 inches, red (2.5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common fine quartz grains; few fine pores; slightly acid; gradual smooth boundary.

B3—40 to 53 inches, red (2.5YR 4/6) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common quartz grains; neutral; abrupt smooth boundary.

R—53 inches, limestone rock.

The solum thickness and depth to hard limestone is 40 to 60 inches. Reaction throughout ranges from medium acid to neutral.

The A horizon has hue of 5YR or 2.5YR, value of 2 or 3, and chroma of 2 to 4.

The B2 horizons have hue of 2.5YR, value of 3 or 4, and chroma of 3 to 8.

Montegrande series

The Montegrande series consists of fine, mixed, isohyperthermic Vertic Eutropepts. These soils are deep, are moderately well drained, and have B2 horizons of dark brown and grayish brown clay. They formed in fine textured sediments derived from volcanic rocks. The Montegrande soils are on foot slopes and alluvial fans. Slopes range from 2 to 12 percent, but are dominantly 5 to 12 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 80 degrees F.

The Montegrande soils are associated with the Mabi, Rio Arriba, and Mucara soils. They have a thicker solum than the Mucara soils and are similar to the Mabi soils except for having very gravelly clay C horizons. They have a thinner solum and yellower color than the Rio Arriba soils.

Typical pedon of Montegrande clay, 2 to 5 percent slopes, 200 yards north from kilometer 5.65 of Highway 30, Gurabo Experiment Station, Gurabo, P.R.

Ap 0 to 7 inches, very dark grayish brown (10YR 3/2) clay; common fine faint reddish brown (5YR 4/4) mottles; weak fine granular structure; very hard, firm, slightly sticky, plastic; common fine black mineral grains; few fine rock fragments; common fine roots; strongly acid; clear smooth boundary.

B21—7 to 12 inches, dark brown (10YR 3/3) clay; mottles are common fine distinct yellowish brown (10YR 5/6), few fine faint gray (10YR 5/1), and common fine distinct greenish gray (5GY 5/1); weak medium angular blocky structure with few pressure faces; firm, slightly sticky, plastic; common fine black mineral grains; common fine roots; few fine rock fragments; slightly acid; clear wavy boundary.

B22—12 to 21 inches, grayish brown (10YR 5/2) clay; common medium distinct greenish gray (5GY 5/1) and common fine faint gray (10YR 5/1) mottles; weak coarse angular blocky structure with common pressure faces and slickensides; firm, slightly sticky, plastic; few fine black mineral grains; common fine roots; few fine rock fragments; slightly acid; gradual wavy boundary.

C1—21 to 29 inches, mixed dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) clay; weak medium and coarse angular blocky structure with common pressure faces and slickensides; firm, slightly sticky, plastic; few fine black mineral grains; few fine roots; neutral; clear wavy boundary.

IIC2—29 to 39 inches, brown (10YR 5/3) when rubbed very gravelly clay; massive with common pressure faces; firm, sticky, plastic; few fine black mineral grains; many sand size volcanic grains; about 55 percent of horizon is weathered and partially weathered volcanic rock fragments of mixed colors; neutral; gradual wavy boundary.

IIC3—39 to 48 inches, yellowish brown (10YR 5/4) when rubbed very gravelly clay; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; about 55 percent of horizon is weathered and partially weathered volcanic rock fragments of mixed colors; neutral; gradual wavy boundary.

The solum is 20 to 36 inches thick. Reaction throughout ranges from strongly acid in the A horizon to neutral in the lower horizons.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3.

The B2 horizon has hue of 7.5YR and 10YR, value of 3 to 5, and chroma of 2 to 4. It has weak medium to coarse angular to subangular blocky structure.

The C horizons are clay and very gravelly clay.

Morado series

The Morado series consists of fine-loamy, mixed, isohyperthermic Typic Eutropepts. These soils are moderately deep, are well drained, and have a mottled, reddish gray clay loam B2 horizon. They formed in residuum of volcanic rocks. The Morado soils are on side slopes, foot slopes, and hilltops of strongly dissected humid uplands. Slopes range from 40 to 60 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 76 degrees F.

The Morado soils are associated with the Mucara and Gaguabo series. They occupy similar positions in the landscape, but are deeper than the Caguabo soils. They have a thicker solum than the Mucara soils.

Typical pedon of Morado clay loam, 40 to 60 percent, eroded, 25 meters east from kilometer 2.9 of Highway 615, then 15 feet north.

Ap—0 to 8 inches, weak red (10R 4/2) clay loam; weak fine subangular blocky structure; friable, slightly sticky, plastic; common fine roots; neutral; clear smooth boundary.

B2—8 to 19 inches, reddish gray (5YR 5/2) clay loam; few fine faint red (2.5YR 4/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, plastic; common fine roots; neutral; gradual wavy boundary.

B3—19 to 26 inches, variegated strong brown (7.5YR 5/6), dark reddish gray (5YR 4/2), weak red (2.5YR 4/2), and red (2.5YR 4/8) clay loam; massive; friable, slightly sticky, plastic; few fine roots; neutral; clear wavy boundary.

C—26 to 34 inches, variegated gray (5YR 5/1), light gray (7.5YR 7/0), and dark reddish gray (5YR 4/2) clay loam saprolite; massive; friable, slightly sticky, plastic; slightly acid; clear wavy boundary.

R—34 inches, reddish brown semiconsolidated rock.

The solum is 16 to 30 inches thick. Reaction throughout is neutral to slightly acid.

The A horizon has hue of 10R, 2.5YR, and 5YR; value of 4 or 5; and chroma of 1 to 3.

The B horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 8. It has weak fine subangular blocky structure.

Mucara series

The Mucara series consists of clayey, montmorillonitic, isohyperthermic, shallow Vertic Eutropepts. These soils

are moderately deep, are well drained, and have a B horizon of dark brown clay. They formed in residuum of basic volcanic rocks. The Mucara soils are on foot slopes, side slopes, and rounded hilltops of strongly dissected humid uplands. Slopes range from 12 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Mucara soils are associated with the Caguabo, Morado, and Naranjito soils. They are deeper than the Caguabo soils, have a thinner solum than the Morado and Naranjito soils, and are yellower than the Naranjito soils.

Typical pedon of Mucara clay, 40 to 60 percent slopes, 0.6 mile from kilometer 67.2 of Highway 1, then 25 feet northwest along farm road.

Ap 0 to 5 inches, very dark grayish brown (10YR 3/2) clay; weak medium granular structure; firm, slightly sticky, plastic; many fine roots; slightly acid; clear smooth boundary.

B—5 to 12 inches, dark brown (10YR 3/3) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; thin patchy clay films along root channels and on faces of peds; few fine roots; common pressure faces; few fine dark concretions; few fine subrounded rock fragments; slightly acid; abrupt wavy boundary.

C—12 to 30 inches, highly weathered volcanic rocks, neutral.

R—30 inches, semiconsolidated volcanic rocks.

The solum is 10 to 20 inches thick. Reaction throughout is slightly acid to neutral. Depth to semiconsolidated volcanic rock ranges from 20 to 40 inches.

The A horizon has hue of 10YR and 2.5Y, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 7.5YR, 10YR, and 2.5Y; value of 3 to 5; and chroma of 2 to 4.

Naranjito series

The Naranjito series consists of clayey, mixed, isohyperthermic Typic Tropohumults. These soils are moderately deep, are well drained, and have a B horizon of reddish brown and yellowish red clay. They formed in residuum of volcanic rocks. The Naranjito soils occur on side slopes and hilltops of strongly dissected humid uplands. Slopes range from 12 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 76 degrees F.

The Naranjito soils are associated with the Mucara, Caguabo, Sabana, and Consumo soils. They have a thicker solum than the Mucara, Sabana, and Caguabo soils. They are on less weathered volcanic rock than the Consumo soils.

Typical pedon of Naranjito silty clay loam, 20 to 40 percent slopes, eroded, 100 feet east of intersection of Highway 833 with old trail to Fondo del Saco, Bo. Achiote, Naranjito, P.R.

Ap—0 to 4 inches, brown to dark brown (10YR 4/3) silty clay loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; common fine rounded and subrounded rock fragments; very strongly acid; clear smooth boundary.

B2t—4 to 12 inches, reddish brown (5YR 4/4) clay; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; thin patchy clay films; common fine dark concretions; very strongly acid; clear smooth boundary.

B3—12 to 24 inches, yellowish red (5YR 4/6) clay; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; common fine dark concretions; thin patchy clay films; very strongly acid; clear smooth boundary.

C—24 to 40 inches, variegated yellowish red (5YR 4/6), red (2.5YR 4/6), and light yellowish brown (10YR 6/4) clay loam saprolite; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; strongly acid; abrupt smooth boundary.

R—40 inches, consolidated volcanic rock.

The solum is 15 to 30 inches thick. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 10YR and 7.5YR, value of 3 to 5, and chroma of 3 to 4.

The B horizon has hue of 5YR, 10YR, and 2.5YR; value of 4 or 5; and chroma of 3 to 6.

Pandura series

The Pandura series consists of loamy, mixed, isohyperthermic, shallow Typic Eutropepts. These soils are shallow, are well drained, and have a B horizon of dark, yellowish brown sandy loam. They formed in residuum of plutonic rocks. The Pandura soils are on side slopes and hilltops of dissected uplands. Slopes range from 12 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 80 degrees F.

The Pandura soils are associated with the Lirios, Jagueyes, Candelero, and Cayagua soils. They have a thinner solum and are coarser textured than the Lirios and Jagueyes soils. They are better drained, shallower, and coarser textured than the Candelero and Cayagua soils.

Typical pedon of Pandura sandy loam, 20 to 40 percent slopes, 90 feet southwest from kilometer 3.85 of Highway 181, San Lorenzo, P.R.

Ap 0 to 7 inches, dark brown (10YR 4/3) sandy loam; weak fine subangular blocky structure parting to granular; friable, nonsticky, nonplastic; common fine roots; few fine quartz grains; strongly acid; clear smooth boundary.

B—7 to 12 inches, dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable, nonsticky, slightly plastic; common fine roots; common fine quartz grains; few dark minerals; few krotovinas; strongly acid; clear smooth boundary.

C1—12 to 26 inches, mixed very pale brown (10YR 7/4), pale brown (10YR 6/3), dark yellowish brown (10YR 4/4), and white (10YR 8/2) sandy loam saprolite; massive, but rock structure is evident; few fine roots; silty clay material with a dark grayish brown color (10YR 4/2) is deposited between rock cleavage; medium acid; gradual smooth boundary.

C2—26 inches, weathered granitic rock that can be penetrated with a spade.

The solum is 6 to 14 inches thick. Reaction throughout is medium acid to strongly acid.

The A horizon has hue of 10YR and 7.5YR, value of 3 or 4, and chroma of 3 or 4.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6.

Pellejas series

The Pellejas series consists of fine-loamy over sandy or sandy-skeletal, mixed, isohyperthermic Typic Dystropepts. These soils are deep, are somewhat excessively drained, and have a B2 horizon of dark yellowish brown

clay loam. They formed in residuum of plutonic rocks. The Pellejas soils are on side slopes and narrow ridges of strongly dissected humid uplands. Slopes range from 40 to 60 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Pellejas soils are associated with the Mucara, Caguabo, Consumo, and Naranjito soils. They have a thicker solum than the Mucara and Caguabo soils. They have yellower hue and lack the argillic horizons of the Consumo and Naranjito soils.

Typical pedon of Pellejas clay loam, 40 to 60 percent slopes, 200 feet northwest from kilometer 17.0 of Highway 152, Bo. Cedro Abajo, Naranjito, P.R.

Ap—0 to 4 inches, dark brown (10YR 4/3) clay loam; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; common fine roots; few krotovinas; common quartz grains; few fine pores; subsurface material is mixed with surface horizon; very strongly acid; clear smooth boundary.

B2—4 to 12 inches, yellowish brown (10YR 5/4) clay loam; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; common fine and medium roots; common quartz grains; few krotovinas that have white mottles from the parent material; few dark minerals; very strongly acid; gradual smooth boundary.

B3—12 to 16 inches, yellowish brown (10YR 5/4) clay loam; weak fine subangular blocky structure; very friable, nonsticky, slightly plastic; few fine roots; some dead roots; few dark minerals; few krotovinas; common quartz grains; about 25 percent of this horizon is saprolite; very strongly acid; gradual smooth boundary.

C1—16 to 42 inches, pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) sandy loam; massive; very friable, nonsticky, nonplastic; this horizon consists mostly of saprolite; strongly acid; gradual smooth boundary.

C2—42 to 60 inches, variegated gray (10YR 6/1), white (10YR 8/1), pinkish gray (5Y 6/2), and dark greenish gray (5GY 4/1), loamy sand saprolite; massive; very friable, loose; strongly acid.

The solum is 11 to 20 inches thick. Reaction throughout ranges from strongly acid to very strongly acid.

The A horizon has hue of 10YR, value of 2 or 4, and chroma of 2 or 3.

The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4.

Reilly series

The Reilly series consists of sandy-skeletal, mixed, isohyperthermic Fluventic Hapludolls. These soils are shallow to gravel, are excessively drained, and have a dark brown sandy loam Ap horizon over dark brown gravelly sand and clean sand and gravel C horizons. They formed in sediments of mixed origin. The Reilly soils are on river flood plains adjacent to streams. Slopes range from 0 to 2 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 80 degrees F.

The Reilly soils are associated with the Toa, Coloso, Bajura, and Dique soils. They are better drained and are shallower and coarser textured than the Bajura and Coloso soils. They have gravelly subsurface layers that the Dique soils lack. They are coarser textured than the Toa soils.

Typical pedon of Reilly sandy loam, 400 feet northwest of the entrance to the Gurabo Experiment Station, north of Highway 941.

Ap—0 to 7 inches, dark brown (10YR 3/3) sandy loam; very weak fine granular structure; very friable, slightly sticky, nonplastic; many roots; medium acid; gradual smooth boundary.

C1 7 to 18 inches, dark brown (10YR 3/3) gravelly sand; massive; very friable; many roots; medium acid; gradual smooth boundary.

C2—18 to 55 inches, coarse clean sand and gravel; about 60 percent coarse gravel; slightly acid.

The A horizon is 7 to 15 inches thick. Reaction throughout is medium acid to slightly acid.

The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3.

Rio Arriba series

The Rio Arriba series consists of fine, mixed, isohyperthermic Vertic Paleudalfs. These soils are deep, are moderately well drained, and have a B22t horizon of yellowish brown clay. They formed in sediments of mixed origin. The Rio Arriba soils are on alluvial fans and terraces above the river flood plains. Slopes range from 2 to 12 percent, but are dominantly 5 to 12 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 80 degrees F.

The Rio Arriba soils are associated with the Mabi, Montegrande, Mucara, and Caguabo soils. They have a thicker solum than the Mucara and Caguabo soils and are better drained than the Mabi soils. They lack the gravelly clay C horizon of the Montegrande soils.

Typical pedon of Rio Arriba clay, 5 to 12 percent slopes, eroded, 0.4 kilometers west of the town of Gurabo, P.R., then 800 feet east of the western boundary of the Gurabo Experiment Station farm, and 600 feet north of the railroad tracks.

Ap—0 to 8 inches, brown (10YR 4/3) clay; weak coarse granular structure; hard, firm, slightly sticky, plastic; many fine roots; neutral; clear smooth boundary.

B21t—8 to 16 inches, yellowish brown (10YR 5/8) clay; moderate coarse prismatic structure parting to weak medium subangular blocky; yellowish brown (10YR 5/4) thin continuous coatings on vertical ped surfaces, and patchy coatings on horizontal ped surfaces; hard, firm, slightly sticky, plastic; common fine roots; common fine black nodules; medium acid; clear smooth boundary.

B22t—16 to 28 inches, yellowish brown (10YR 5/6) clay; common medium distinct yellowish red (5YR 4/6) mottles; weak coarse angular blocky structure with few slickensides and pressure faces; firm, slightly sticky, plastic; many fine black nodules; few fine roots; neutral; clear wavy boundary.

B23t—28 to 60 inches, reddish yellow (7.5YR 6/6) clay; many medium distinct red (2.5YR 5/6) mottles; weak coarse angular blocky structure; pressure faces with discontinuous clay coatings on ped surfaces; firm, slightly sticky, plastic; many fine black nodules; mildly alkaline.

The solum is more than 60 inches thick. Reaction throughout ranges from medium acid to mildly alkaline.

The A horizon has hue of 10YR and 7.5YR, value of 3 and 4, and chroma of 2 to 4.

The B2t horizon has hue of 10YR, 7.5YR, and 2.5YR; value of 4 to 6; and chroma of 4 to 8.

Rio Piedras series

The Rio Piedras series consists of clayey kaolinitic isohyperthermic Typic Tropohumults. These soils are moderately deep, well drained, and have a B2t horizon of red clay. They formed in residuum of siltstone. The Rio Piedras soils are on side slopes of dissected uplands. Slopes range from 12 to 60 percent, but are dominantly 12

to 20 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 80 degrees F.

The Rio Piedras soils are associated with the Yunes soils. They are deeper and have thick argillic horizons which the Yunes soils lack.

Typical pedon of Rio Piedras clay, 12 to 20 percent slopes, eroded, 300 feet southwest from kilometer 1.1 of Guadalcanal road in an orchard at the Rio Piedras Experiment Station, Rio Piedras, P.R.

Ap 0 to 8 inches, dark brown (7.5YR 4/4) clay; moderate medium granular structure; hard, firm, slightly sticky, slightly plastic; very strongly acid; abrupt smooth boundary.

B2t—8 to 18 inches, red (10R 4/6) clay; few fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; continuous dark reddish brown (2.5YR 3/4) clay films on most peds and in root channels; clay films thicker on vertical ped faces; very hard, very firm, slightly sticky, slightly plastic; few small soft black concretions; common small shale fragments; roots mainly along cleavage planes; very strongly acid; gradual wavy boundary.

B3—18 to 28 inches, red (10R 4/6) clay; common fine and medium distinct red (2.5YR 4/6) and brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; patchy reddish brown (5YR 4/4) clay films on peds and in root channels; very hard, very firm, slightly sticky, slightly plastic; many partially weathered shale fragments; original shale structure visible; very strongly acid; gradual wavy boundary.

C1 28 to 34 inches, mixed red (2.5YR 4/6) and brownish yellow (10YR 6/6) clay; common fine distinct light gray (10YR 7/1) and strong brown (7.5YR 5/6) mottles; massive; original structure of shale visible; many small shale fragments easily broken by fingers; very strongly acid; gradual wavy boundary.

C2—34 to 48 inches, bedded partially weathered clay shale that can be penetrated with soil auger; shale has mixed colors with light red (2.5YR 6/8), strong brown (7.5YR 5/8), and pink (7.5YR 7/4) predominating; very strongly acid.

R—48 inches, bedded cemented shale; beds range from 1 to 4 inches thick.

The solum is 20 to 34 inches thick. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 7.5YR and 5YR, value of 3 to 5, and chroma of 3 or 4.

The B2t horizon has hue of 5YR, 2.5YR, and 10R; value of 4 or 5; and chroma of 6 to 8.

Sabana series

The Sabana series consists of clayey, mixed, isohyperthermic Lithic Dystropepts. These soils are shallow, are well drained, and have a B2 horizon of dark brown silty clay. They formed in residuum of volcanic rocks. The Sabana soils are on side slopes and narrow ridgetops of humid volcanic uplands. Slopes range from 40 to 60 percent. The mean annual precipitation is 85 inches, and the mean annual temperature is 80 degrees F.

The Sabana soils are associated with the Mucara and Caguabo soils. They have a thinner solum than the Mucara soils. They are more acid than the Caguabo soils.

Typical pedon of Sabana silty clay loam, 40 to 60 percent slopes, 500 feet southeast from kilometer 53.5 of Highway 1, Cayey, P.R.

Ap—0 to 3 inches, very dark grayish brown (10YR 3/1) silty clay loam; weak fine granular structure; firm, slightly sticky, slightly plastic; about 5 percent volcanic rock fragments; common fine roots; strongly acid; clear wavy boundary.

B2—3 to 8 inches, dark brown (10YR 4/3) silty clay; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; about 5 percent volcanic rock fragments; few fine pores; few fine patchy clay films; few fine roots; strongly acid; clear smooth boundary.

B3—8 to 15 inches, variegated light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic, about 10 percent volcanic rock fragments; few fine roots; few fine patchy clay films; strongly acid; abrupt wavy boundary.

R—15 inches, semiconsolidated volcanic rock.

The solum thickness and depth to the rock is 10 to 20 inches. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 10YR and 7.5YR, value of 3 or 4, and chroma of 1 to 3.

The B2 horizon has hue of 10YR, 7.5YR, and 5YR; value of 4 to 6; and chroma of 3 to 8.

Sabana Seca series

The Sabana Seca series consists of clayey, mixed, isohyperthermic Oxic Plinthaquults. These soils are deep, are poorly drained, and have a B22g horizon of light gray clay. They formed in sediments of mixed origin. The Sabana Seca series are on humid coastal plains. Slopes range from 2 to 8 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 80 degrees F.

The Sabana Seca soils are associated with the Almirante and Bajura soils. They have more plinthite than the Almirante soils and are poorly drained. They occupy higher positions and have thicker B horizons than the Bajura soils.

Typical pedon of Sabana Seca clay, 2 to 8 percent slopes, 400 meters east from kilometer 8.5 of Highway 866, Toa Baja, P.R.

Ap—0 to 10 inches, very dark grayish brown (10YR 3/2) clay; weak fine subangular blocky structure parting to weak fine granular; firm, slightly sticky, plastic; many fine roots; extremely acid; abrupt smooth boundary.

B1—10 to 13 inches, dark grayish brown (2.5Y 4/2) clay; many medium and coarse prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular and angular blocky structure; firm, slightly sticky, plastic; common fine roots; thin patchy clay films on ped faces; dark gray (10YR 4/1) coloration on old root channels and in cracks; extremely acid; clear wavy boundary.

B21tg—13 to 28 inches, light gray (5Y 6/1) clay; many coarse prominent yellowish brown (10YR 5/6) and few fine prominent red (10R 4/6) mottles; very weak coarse prismatic structure parting to moderate medium subangular and angular blocky; firm, slightly sticky, plastic; common fine roots; thin patchy clay films on ped faces; dark gray (10YR 4/1) coloration on old root channels and on ped faces; extremely acid; gradual smooth boundary.

B22tg—23 to 36 inches, light gray (5Y 6/1) and (5Y 7/1) clay; many fine to coarse strong brown (7.5YR 5/6) and common medium and coarse prominent dark red (10R 3/6) mottles, and a few specks of red (2.5YR 4/6); very weak coarse prismatic structure parting to moderate medium subangular and angular blocky; firm, slightly sticky, plastic; few fine roots; common fine concretions; thin patchy clay films on ped faces; extremely acid; gradual smooth boundary.

B23tg—36 to 48 inches, white (5Y 8/1) and (5Y 8/2) clay; many fine, medium, and coarse prominent dusky red (10R 3/4) and strong brown (7.5YR 5/6) mottles and concretions; weak coarse prismatic structure parting to weak medium subangular and angular blocky; firm, slightly sticky, plastic; thin patchy clay films on vertical and horizontal ped faces; extremely acid; clear smooth boundary.

B24tg—48 to 56 inches, white (5Y 8/1) clay; many coarse prominent dusky red (10R 3/4) and common fine to coarse prominent strong brown (7.5YR 5/8) mottles and concretions; weak coarse prismatic structure; firm, slightly sticky, plastic; thin patchy clay films on vertical ped faces; extremely acid; clear smooth boundary.

B25g—56 to 70 inches, white (5Y 8/1) clay; many coarse prominent dusky red (10R 3/4) and dark red (10R 3/6), and few fine prominent red (10R 4/8) and strong brown (7.5YR 5/8) mottles and concretions; weak coarse prismatic structure; firm, slightly sticky, plastic; very few patchy clay films on vertical faces; extremely acid.

The solum is more than 60 inches thick. Reaction throughout is very strongly acid to extremely acid.

The A horizon has hue of 10YR and 2.5Y, value of 2 or 3, and chroma of 1 to 3.

The B2tg horizon has hue of 2.5Y and 5Y, value of 6 to 8, and chroma of 2 or less.

Saladar series

The Saladar series consists of euic, isohyperthermic Fluvaquentic Troposaprists. These soils are deep, are poorly drained, and have thick black muck O horizons. They formed in highly decomposed organic materials. The Saladar soils are in closed depressions and coastal marshes with restricted outlets. Slopes range from 0 to 2 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Saladar soils are associated with the Martin Pena and Bajura soils. They lack mineral horizons and are slightly lower than the Martin Pena and Bajura soils.

Typical pedon of Saladar muck, 530 feet west of the corner of Dr. Joaquin Bosch Street and Dr. Colly Toste Street, Levittown Urbanization, Catano, P.R.

Oa1—0 to 10 inches, black (10YR 2/1) muck; black (10YR 2/1) when rubbed and pressed; about 30 percent fiber, about 10 percent when rubbed; weak fine granular structure; nonsticky; mildly alkaline; gradual smooth boundary.

Oa2—10 to 35 inches, black (10YR 2/1) muck; black (10YR 2/1) when rubbed and pressed; about 25 percent fiber, about 10 percent when rubbed; weak medium granular structure; nonsticky; neutral; gradual smooth boundary.

Oa3—35 to 51 inches, black (10YR 2/1) muck; black (10YR 2/1) when rubbed and pressed; about 25 percent fiber, 10 percent when rubbed; massive; nonsticky; neutral.

The organic portion of the control section has colors in hue of 10YR, value of 2, and chroma of 0 or 1. Reaction throughout ranges from mildly alkaline to neutral.

Soller series

The Soller series consists of clayey, mixed, isohyperthermic, shallow Eutropeptic Rendolls. These soils are shallow, are well drained, and have a B horizon of dark brown clay. They formed in residuum of limestone. The Soller soils are on side slopes and hilltops of low rounded hills. Slopes range from 20 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 90 inches, and the mean annual temperature is 75 degrees F.

The Soller soils are associated with the Colinas and the Tanama soils. They have a thinner solum than the Colinas soils and are underlain by hard limestone. They are yellower and not as acid as the Tanama soils.

Typical pedon of Soller clay loam, 40 to 60 percent slopes, 400 feet south of Riverside Urbanization, then 250 feet southwest of water pump, Bayamon, P.R.

A1—0 to 5 inches, very dark grayish brown (10YR 3/2) clay loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; common fine roots; few quartz grains; common limestone rock fragments; mildly alkaline; clear smooth boundary.

B—5 to 12 inches, dark brown (10YR 3/3) clay; moderate coarse subangular blocky structure; firm, slightly sticky, plastic; common limestone rock fragments; common fine roots; moderately alkaline; gradual smooth boundary.

C—12 to 24 inches, yellow (10YR 7/6) weathered limestone; massive; friable, slightly sticky, slightly plastic; strongly alkaline; gradual smooth boundary.

R—24 inches, hard fragmental limestone.

The solum is 10 to 20 inches thick. Reaction throughout ranges from neutral to moderately alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The B horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It has weak to moderate medium to coarse subangular blocky structure.

Tanama series

The Tanama series consists of clayey, mixed, isohyperthermic, Lithic Tropudalfs. These soils are shallow, are well drained, and have a B2t horizon of reddish brown clay. They formed in residuum of limestone. The Tanama soils are on side slopes and foot slopes of limestone hills. Slopes range from 20 to 60 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 80 degrees F.

The Tanama soils are associated with the Juncal and Soller soils. They have a thinner solum and are shallower than the Juncal soils. They are redder and more acid than the Soller soils.

Typical pedon of Tanama clay in an area of Tanama-Rock outcrop complex, 20 to 60 percent slopes, 0.8 mile southwest from kilometer 0.95 of Highway 659, Bo. Santa Rosa, Dorado, P.R.

A1—0 to 4 inches, dark reddish brown (5YR 3/2) clay; weak fine subangular blocky structure; friable, slightly sticky, plastic; many fine roots; common fine and medium limestone fragments; few quartz grains; neutral; clear smooth boundary.

B2t—4 to 14 inches, reddish brown (5YR 4/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; common fine and medium roots; thin patchy clay films; common fine and medium limestone fragments; mildly alkaline; abrupt wavy boundary.

R—14 inches, hard semiconsolidated limestone.

The solum thickness and depth to rock is 12 to 20 inches. Reaction throughout ranges from slightly acid to mildly alkaline.

The A horizon has hue of 7.5YR and 5YR, value of 3 or 4, and chroma of 2 to 4.

The B2t horizon has hue of 5YR and 2.5YR, value of 4 or 5, and chroma of 4 to 8.

Toa series

The Toa series consists of fine, mixed, isohyperthermic Fluventic Hapludolls. These soils are deep, are moderately well drained to well drained, and have a B horizon of dark brown silty clay loam. They formed in sediments of mixed origin. The Toa soils are on river flood plains in the

humid portion of the island. Slopes range from 0 to 2 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Toa soils are associated with the Dique, Reilly, Coloso, and Bajura soils. They are better drained and coarser textured than the Bajura and Coloso soils. They are finer textured and have slower permeability than the Dique and Reilly soils.

Typical pedon of Toa silty clay loam, 250 feet southwest along fence next to old bridge and 100 feet southeast, which is west of the entrance to the Rio Piedras Experiment Station.

Ap—0 to 8 inches, dark brown (10YR 3/3) silty clay loam; moderate medium granular structure; slightly hard, friable, nonsticky, slightly plastic; many roots; slightly acid; clear smooth boundary.

B—8 to 16 inches, dark brown (10YR 3/3) silty clay loam; few fine faint pale brown (10YR 6/3) mottles; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; slightly acid; gradual smooth boundary.

C1—16 to 56 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) when crushed; many fine distinct dark reddish brown (5YR 3/4) and few fine faint light gray mottles; weak medium and coarse subangular blocky structure; ped surfaces and root channels have a grayish brown (2.5YR 5/2) coating at lower depths; slightly hard, friable, slightly sticky, slightly plastic; common roots; common black concretions; thin lenses of sand; slightly acid; gradual smooth boundary.

C2—56 to 60 inches, dark brown (7.5YR 4/4) silty clay loam; many fine distinct gray and brown mottles; massive; friable, nonsticky, slightly plastic; common fine sand grains; slightly acid.

The mollic epipedon is 12 to 20 inches thick. Reaction throughout is slightly acid to neutral.

The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3.

The B horizon has hue of 10YR, value of 3, and chroma of 2 or 3.

Torres series

The Torres series consists of clayey, oxidic, isohyperthermic Plinthic Palehumults. These soils are deep, are excessively drained, and have a B2t horizon of yellowish brown clay. They formed in sediments of mixed origin. The Torres soils are on coastal plains and in trapped valleys between the haystack hills. Slopes range from 2 to 5 percent. The mean annual precipitation is 80 inches, and the mean annual temperature is 78 degrees F.

The Torres soils are associated with the Almirante, Bayamon, and Matanzas soils. They have a loamy sand A horizon that the Almirante, Bayamon, and Matanzas soils lack. They also lack the uniform red profiles of the Bayamon and Matanzas soils.

Typical pedon of Torres loamy sand, 2 to 5 percent slopes, 0.15 mile along a dirt road south from kilometer 25.5 of Highway 2, then 60 feet west of dirt road.

Ap—0 to 10 inches, very dark grayish brown (10YR 3/2) loamy sand; single grain; loose, nonsticky, nonplastic; common fine roots; few fine black concretions; strongly acid; gradual smooth boundary.

A11—10 to 21 inches, dark brown (10YR 3/3) loamy sand; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; few fine roots; few fine black concretions; strongly acid; gradual smooth boundary.

A12—21 to 28 inches, dark brown (10YR 3/3) sandy loam; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; common fine black concretions; strongly acid; abrupt smooth boundary.

B21t—28 to 36 inches, yellowish brown (10YR 5/8) clay; few fine prominent red (10R 4/8) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; thin clay films on ped faces; few sand sized quartz grains; strongly acid; gradual smooth boundary.

B22t—36 to 43 inches, yellowish brown (10YR 5/8) clay; common medium prominent red (10R 4/6) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; thin clay films on ped faces; few sand sized quartz grains; strongly acid; gradual smooth boundary.

B23t—43 to 64 inches, yellowish brown (10YR 5/8) clay; common medium prominent dark red (10R 3/6) and few medium prominent light gray (5Y 7/1) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; thin continuous clay films on ped faces; few fine quartz grains; strongly acid.

The solum is more than 60 inches thick. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 10YR and 7.5YR, value of 3, and chroma of 2 to 4.

The B2t horizon has hue of 7.5YR and 10YR, value of 4 to 6, and chroma of 6 to 8.

Vega Alta series

The Vega Alta series consists of clayey, mixed, isohyperthermic Plinthic Tropudults. These soils are deep, are well drained, and have a B22t horizon of red and brownish yellow clay that contains plinthite. They formed in sediments of mixed origin. The Vega Alta soils are on coastal plains and terraces. Slopes range from 2 to 12 percent, but are dominantly 5 to 12 percent. The mean annual precipitation is 76 inches, and the mean annual temperature is 77 degrees F.

The Vega Alta soils are associated with the Almirante, Vega Baja, Bajura, and Coloso soils. They are on higher geomorphic positions and are better drained than the Bajura, Coloso, and Vega Baja soils. They have a thinner solum and are shallower to plinthite than the Almirante soils.

Typical pedon of Vega Alta clay loam, 2 to 5 percent slopes, 150 feet north of radio station, 50 feet south of trail east of Rum Pilot Plant; section of experimental farm north of Highway 1 to Caguas, Rio Piedras Experiment Station, Rio Piedras, P.R.

Ap—0 to 8 inches, dark yellowish brown (10YR 3/4) clay loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine black concretions; common fine roots; strongly acid; abrupt wavy boundary.

B1—8 to 14 inches, reddish yellow (7.5YR 6/8) and yellowish red (5YR 4/6) clay; weak medium and coarse subangular blocky structure parting to moderate fine granular structure; firm, slightly sticky, slightly plastic; thin patchy clay films on ped faces and in root channels; many fine black concretions; few fine roots; strongly acid; clear wavy boundary.

B21t—14 to 25 inches, red (2.5YR 4/8) and strong brown (7.5YR 5/8) clay; moderate medium and coarse subangular blocky structure parting to weak medium angular blocky; firm, slightly sticky, slightly plastic; thick patchy clay films on ped faces; few fine black concretions; few fine roots; strongly acid; gradual wavy boundary.

B22t—25 to 36 inches, red (2.5YR 4/8) and brownish yellow (10YR 6/8) clay; weak medium and coarse subangular blocky structure; firm, nonsticky, slightly plastic; brownish yellow clay films in root channels; nodules of plinthite; few fine quartz grains; very strongly acid; gradual wavy boundary.

B23t—36 to 52 inches, dark red (10R 3/6), strong brown (7.5YR 5/8), and light gray (5Y 7/1) clay; weak coarse subangular blocky structure; friable, nonsticky, slightly plastic; thin patchy clay films; lenses of plinthite; very strongly acid; gradual wavy boundary.

BC—52 to 84 inches, dark red (10R 3/6), brownish yellow (10YR 6/8), and light gray (5Y 7/1) clay; massive; friable, nonsticky, slightly plastic; very strongly acid.

The solum is less than 60 inches thick. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 7.5YR and 10YR, value of 3 or 4, and chroma of 2 or 3.

The B2t horizon has hue of 10R, 2.5YR, 7.5YR, and 10YR; value of 3 to 6; and chroma of 6 to 8.

Vega Baja series

The Vega Baja series consists of fine, mixed, isohyperthermic Aeric Tropaqualfs. These soils are deep, are poorly drained, and have a B22t horizon of strong brown and gray silty clay. They formed in sediments of mixed origin. The Vega Baja soils are on coastal plains and alluvial fans. Slopes range from 0 to 2 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 80 degrees F.

The Vega Baja soils are associated with the Coloso, Bajura, Toa, and Vega Alta soils. They are at slightly higher elevations above the flood plain than the Bajura and Coloso soils and are underlain by mottled coastal plains clays. They are more poorly drained than the Vega Alta and Toa soils. They lack the plinthite layers of the Vega Alta soils.

Typical pedon of Vega Baja silty clay, 200 feet north on road to Food Technology Laboratory and 200 feet to the right of the road (section of farm north of Highway 1 to Caguas, P.R.), Rio Piedras Experiment Station, Rio Piedras, P.R.

Ap—0 to 7 inches, dark brown (10YR 4/3) silty clay; weak fine granular structure; firm, slightly sticky, slightly plastic; few fine black concretions; many fine roots; very strongly acid; gradual wavy boundary.

A12—7 to 12 inches, mixed dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) silty clay; weak coarse subangular blocky structure; firm, sticky, plastic; few fine black concretions; many fine roots; strongly acid; abrupt wavy boundary.

B21t—12 to 17 inches, dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) silty clay; weak coarse subangular blocky structure; firm, slightly sticky, slightly plastic; few fine black concretions; black coatings on ped faces and in root channels; few fine roots; very strongly acid; abrupt wavy boundary.

B22t—17 to 32 inches, mixed strong brown (7.5YR 5/8) and gray (5Y 6/1) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; seams between peds and root channels filled with gray clay; few fine black concretions; very strongly acid; gradual wavy boundary.

B3—32 to 50 inches, brownish yellow (10YR 6/8) and gray (N 7/0) silty clay loam with pockets of yellowish brown (10YR 5/4) clay loam; weak coarse subangular blocky structure; firm, slightly sticky, slightly plastic; few peds and fracture planes coated with black; root channels and worm burrows filled with gray clay; strongly acid; abrupt wavy boundary.

C1—50 to 55 inches, light gray (N 7/0) silty clay; many fine distinct strong brown (7.5YR 5/8) mottles; massive; firm, sticky, plastic; medium acid; abrupt wavy boundary.

C2—55 to 60 inches, light gray (N 7/0) and strong brown (7.5YR 5/8) silty clay; massive; firm, sticky, plastic; medium acid.

The solum is 30 to 60 inches thick. Reaction throughout is medium acid to very strongly acid, and acidity decreases with depth.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 or 4.

The B2t horizon has matrix colors in hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 1 to 8.

Via series

The Via series consists of fine-loamy, mixed, isohyperthermic Typic Tropudalfs. These soils are deep, are well drained, and have a B22t horizon of yellowish brown clay loam. They formed in sediments of mixed origin. The Via soils are on high bottom terraces. Slopes range from 5 to 12 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is 78 degrees F.

The Via soils are associated with the Rio Arriba, Mabi, and Mucara soils. They occupy similar terrace positions to the Rio Arriba soils, but are coarser textured and lack their Vertic properties. They are coarser textured and better drained than the Mabi soils and do not have their expansive clays. They are deeper than the Mucara soils and are not underlain by volcanic rocks.

Typical pedon of Via clay loam, 5 to 12 percent slopes, eroded, 0.6 mile northwest of kilometer 32.8 from Highway 1 along farm road, then 600 feet north to a pangolagrass field, Bo. Bairoa, Caguas, P.R.

Ap—0 to 9 inches, dark brown (10YR 4/3) clay loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common fine pores; about 5 percent rock fragments and rounded pebbles; few coated quartz grains; few fine black concretions; strongly acid; abrupt smooth boundary.

B21t—9 to 17 inches, strong brown (7.5YR 5/8) clay loam; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; about 10 percent rock fragments and rounded pebbles; thin patchy clay films on vertical ped faces; common dark minerals; medium acid; clear smooth boundary.

B22t—17 to 26 inches, yellowish brown (10YR 5/6) clay loam; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; about 10 percent weathered rock fragments; few fine dark minerals; few fine pebbles; thin patchy clay films; medium acid; clear smooth boundary.

B23t—26 to 36 inches, strong brown (7.5YR 5/8) clay loam; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; about 10 percent weathered rock fragments; few fine dark minerals; few fine rounded pebbles; medium acid; clear smooth boundary.

IIC—36 to 60 inches, strong brown (7.5YR 5/8) very gravelly clay loam; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; about 60 percent weathered and unweathered rock fragments; many dark minerals; medium acid.

The solum is 30 to 60 inches thick. Reaction throughout ranges from medium acid to strongly acid.

The A horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4.

The B2t horizon has hue of 10YR and 7.5YR, value of 4 to 6, and chroma of 4 to 8.

Vivi series

The Vivi series consists of coarse-loamy, mixed, isohyperthermic Fluventic Eutropepts. These soils are deep, are well drained, and have a B horizon of dark yel-

lowish brown loam. They formed in sediments derived from plutonic rocks. The Vivi soils are on river flood plains. Slopes range from 0 to 2 percent. The mean annual precipitation is 85 inches, and the mean annual temperature is 80 degrees F.

The Vivi soils are associated with the Pandura soils. They have a thicker solum and are not underlain by plutonic rocks as the Pandura soils are.

Typical pedon of Vivi loam, 90 feet east from kilometer 2.1 from highway 745, Bo. Espino, San Lorenzo, P.R.

Ap—0 to 9 inches, dark brown (10YR 3/3) loam; weak fine granular structure; very friable, nonsticky, nonplastic; common fine roots; few fine black minerals; fine quartz grains; few fine black concretions; strongly acid; clear smooth boundary.

B—9 to 22 inches, dark yellowish brown (10YR 3/4) loam; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; few fine black minerals; common fine quartz grains; strongly acid; clear smooth boundary.

C1—22 to 34 inches, dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; friable, nonsticky, nonplastic; few fine roots; few fine black minerals; common fine quartz grains; very strongly acid; clear smooth boundary.

C2—34 to 47 inches, yellowish brown (10YR 5/4) very fine sandy loam; massive; very friable, nonsticky, nonplastic; few fine black minerals; common fine quartz grains; very strongly acid; clear smooth boundary.

C3—47 to 58 inches, yellowish brown (10YR 5/4) loamy sand; massive; very friable, nonsticky, nonplastic; many fine black minerals; very strongly acid.

The solum is 10 to 22 inches thick. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 10YR to 2.5Y, value of 2 and 3, and chroma of 2 and 3.

The B horizon has hue of 10YR and 2.5Y, value of 3 to 6, and chroma of 2 to 4.

The C horizons are stratified loam, sandy loam, very fine sandy loam, and loamy sand.

Yunes series

The Yunes series consists of loamy-skeletal, mixed, isohyperthermic, shallow Typic Dystropepts. These soils are shallow, are well drained, and have B horizons of dark brown and brown very shaly silty clay loam. They formed in residuum of thin bedded shale. The Yunes soils are on side slopes and tops of strongly dissected uplands. Slopes range from 20 to 60 percent, but are dominantly 40 to 60 percent. The mean annual precipitation is 75 inches, and the mean annual temperature is about 80 degrees F.

The Yunes soils are associated with the Rio Piedras soils. They have a thinner solum and lack the well developed argillic horizons of the Rio Piedras soils.

Typical pedon of Yunes silty clay loam, 20 to 40 percent slopes, 50 feet south of kilometer 2.3 from highway 847, Rio Piedras Experiment station, Rio Piedras, P.R.

A1—0 to 2 inches, dark reddish brown (5YR 3/2) silty clay loam, reddish gray (5YR 5/2) when dry; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; about 10 percent fine shale fragments; strongly acid; abrupt smooth boundary.

B2—2 to 11 inches, dark brown (7.5YR 3/2) very shaly silty clay loam; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; about 60 percent shale fragments; strongly acid; abrupt smooth boundary.

B3—11 to 16 inches, brown (7.5YR 4/4) very shaly silty clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; about 80 percent shale fragments; strongly acid; abrupt smooth boundary.

R—16 inches, mixed light red (2.5YR 6/8), strong brown (7.5YR 5/8), and pink (7.5YR 7/4) bedded fragmental shale with thickness of beds from 1 to 4 inches; when moist, shale can be penetrated with difficulty by a spade.

The solum thickness and depth to rock is 10 to 20 inches. Reaction throughout is strongly acid to very strongly acid.

The A horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 3 to 6. It has weak medium to coarse subangular blocky structure. Shale fragments in the B horizons range from 50 to 80 percent.

Classification

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*4*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 16, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Humult (*Hum*, meaning humus, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Tropohumults (*Tropo*, meaning tropical, plus *humults*, the suborder of Ultisols that have high humus content).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive sub-

group; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Tropohumults.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is clayey, kaolinitic, isohyperthermic Typic Tropohumults.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Formation of the soils

This section describes the five major factors of soil formation and tells how these factors have affected the soils of the San Juan Area.

Factors of soil formation

Soils are formed by the action of soils forming processes on material deposited or accumulated by geologic forces. The characteristics of the soil at any given point are determined by 1) the physical and mineralogical composition of the parent material; 2) the climate under which the material has accumulated and has existed since accumulation; 3) the plant and animal life on and in the soil; 4) the relief, or lay of the land; and 5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of the climate and plant and animal life are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a mature soil. The amount of time can be short or long, but some time is always required for soil horizons to develop.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made about the effect of any one unless conditions are specified for the other four.

Parent material

Parent material is the unconsolidated mass from which the soil forms. It largely determines the chemical and mineralogical composition of the soil. To a large extent, the minerals in the parent material determine the kinds and amounts of clay in the soil. Many of the soils in the San Juan Area formed in place material derived from plutonic rocks, mainly granodiorite and quartz diorite, and from extrusive volcanic rocks such as lava, tuff, breccia, and dune deposits, swamp and marsh deposits, and blanket pre-weathered deposits.

Climate

A soil forms rapidly in the San Juan Area because of the warm tropical climate. This warm climate is favorable throughout the year for rapid chemical and physical reactions, for the decomposition of organic material from plants and animals, and for other soil-forming processes.

The variations in temperature are relatively small within the area, but rainfall varies from place to place and this accounts for some differences in the soils.

Temperature and rainfall govern the rate of weathering of the rocks and the decomposition of minerals. They also influence leaching, eluviation, and illuviation. For example, soils in areas of lower rainfall are not so leached as soils in other parts of the area that originated from the same parent material, but have lost bases and nutrients because of the amount of rainfall.

For more specific information about climate of the San Juan Area, refer to the climate section.

Plants and animals

Plants, animals, fungi, and bacteria are important to soil formation. The changes they bring about depend mainly on the kinds of life processes peculiar to each.

Originally, the San Juan Area was covered by fairly dense tropical forest. A large part was cleared for cultivation. When it was later left idle, low brush and native pasture became dominant. Most of the original native vegetation has been destroyed or seriously disturbed, but its effect on soil formation is visible.

The vegetation is generally responsible for the amount of organic matter in the soil, the color of the surface layer, and the amount of nutrients. Growing plants provide a cover that helps to reduce erosion and stabilize the surface so that the soil-forming processes can continue. Leaves, twigs, and entire plants accumulate on the surface of forest soils and then decompose as a result of percolating water and of microorganisms, earthworms, and other forms of animal life acting on the soil. The roots of plants widen cracks on the rocks and thus permit more water to enter the soil. Also, the uprooting of trees in-

fluences soil formation by mixing the soil layers and loosening the underlying material.

Earthworms, ants, and many other burrowing animals are extremely active in the San Juan Area and help to keep the soil open and porous. They mix the layers of the soil, mix organic matter into the soil, and help break down the remains of plants. Earthworms and other small invertebrates feed on organic matter in the upper few inches of the soil. They slowly but continually mix the soil material and in places alter it chemically.

Bacteria, fungi, and other microorganisms hasten the weathering of rock minerals and the decay of organic matter.

Relief

The shape of the land surface, the slope, and the depth of the water table have had great influence on the formation of the soils in the survey area. Strongly sloping to steep soils, where runoff is moderate to rapid, generally are well drained, have bright colored, unmottled subsoil and are leached to a greater depth than wet soils in the same general area. About 73 percent of the soils of the San Juan Area are steep to very steep.

In level areas or slight depressions, where the water table is at or near the surface for long periods of time, the soils show marked evidence of wetness, as is the case of the Bajura and Martin Pena soils.

Time

In the formation of soils, time is needed for changes to take place in the parent material, and this is usually a long time when measured in years.

The soils of the San Juan Area range from those that show little or no development to older soils that show pronounced development.

Vivi and Dique soils are examples of young soils that formed from sediment that washed from the hills and was deposited on river flood plains. Bayamon, Matanzas, and Vega Alta are three of the older soils of the stable coastal plains, where the parent material has weathered in place for a long time.

References

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(3) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. (Supplements replacing pp. 173-188 issued May 1962)

(4) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436, 754 pp., illus.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient lessens abruptly.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Badland. Steep or very steep, commonly nonstony barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained. Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained. Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained. Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if

less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Landslide. The rapid downhill movement of a mass of soil and loose rock generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size -*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents that commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on exposure to repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade, whereas ironstone cannot be cut but can be broken or shattered with a spade. Plinthite is one form of the material that has been called laterite.

Plutonic rock. A general term applied to the class of igneous rocks that have crystallized at great depths and are generally granitoid in texture.

Polypedon. A volume of soil having properties within the limits of a soil series, the lowest and most homogeneous category of soil taxonomy. A "soil individual."

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Pressure faces. Structural faces that show more evidence of clay than the natural ped surfaces but that do not have clay films. Probably caused by the shrinking and swelling of the soil.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (geology). Soft, earthy, clay-rich, thoroughly decomposed rock formed in place by chemical weathering of igneous and metamorphic rock. In soil survey, the term saprolite is applied to any unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in a landscape where limestone has been locally dissolved.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt*, *silt loam*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Tuff. A compacted deposit 50 percent or more volcanic ash and dust.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Volcanic rock. The class of igneous rocks that have been poured out or ejected at or near the surface. The form is synonymous with extrusive rock and effusive rock.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Illustrations

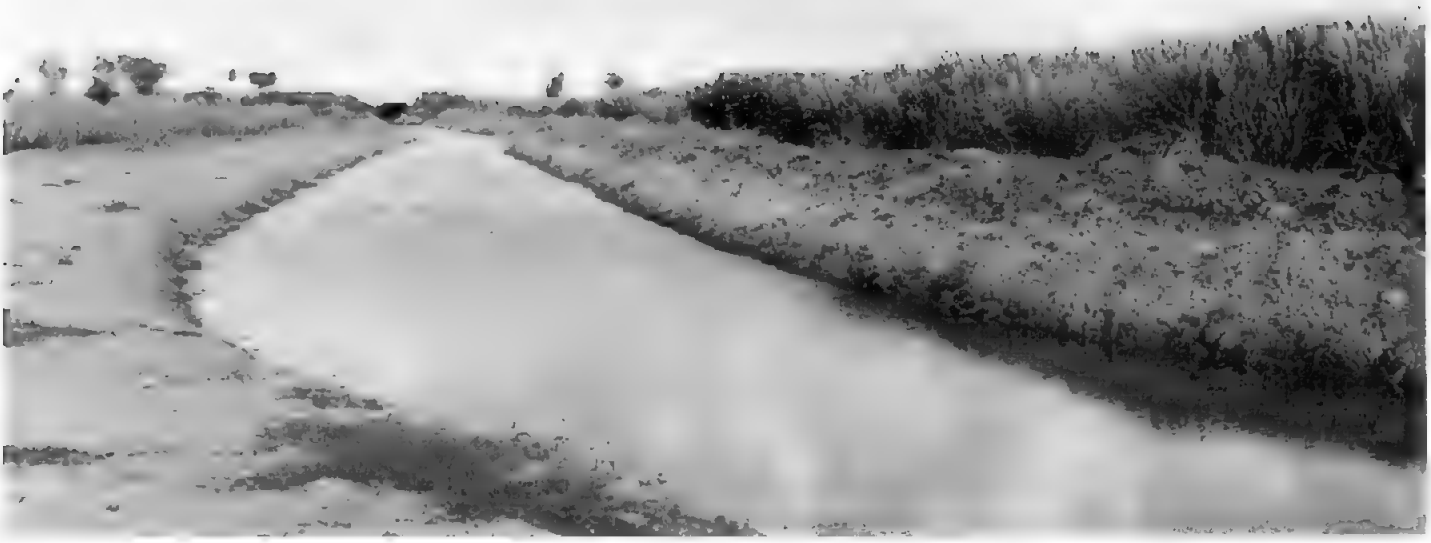

Figure 1.—Adequate drainage is essential in producing high yields of sugarcane on poorly drained Bajura clay.

Figure 2.—High yields of Merker grass are produced on Bayamon clay, 2 to 5 percent slopes, a deep, red, acid soil on the coastal plains.

Figure 3.—Drainage ditch lowers water table and improves drainage of Coloso silty clay loam. This field is planted to sugarcane.

Figure 4.—Field of Daguey clay, 12 to 20 percent slopes, is prepared for planting to taniers and plantains.

Figure 5.—Sugarcane grown on Dique loam. This nearly level, well drained soil is on flood plains.

Figure 6.—Controlling erosion is the major concern of management in this field of Humatas clay, 20 to 40 percent slopes, planted to plantains. Hillside ditches break the length of slope and take excess runoff water slowly out of the field.

Figure 7.—Proper stocking rates and deferred grazing, as well as liming and fertilizing, are the chief management needs of this pasture on Lares clay, 5 to 12 percent slopes, eroded, planted to pangolagrass.

Figure 8.—Contour furrows and hillside ditches help overcome the rapid runoff and erosion hazard on Limones clay, 20 to 40 percent slopes.

Figure 9.—High shrink-swell potential has caused cracks in this wall on Mabi clay, 0 to 2 percent slopes. This soil is severely limited for most urban uses.

Figure 10.—Crop residue management in this field of Toa silty clay loam helps maintain moisture and recycles nutrients back into the soil.

Figure 11.—Harvest of Merker grass on Vega Alta clay loam, 5 to 12 percent slopes, eroded.

Figure 12.—Hillside ditches shorten the slope and reduce runoff and erosion in field of plantains.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	82.5	69.8	76.2	88	64	502	3.21	1.98	4.31	9	.0
February	82.9	69.5	76.2	89	64	454	2.15	1.13	2.99	5	.0
March	84.2	70.4	77.3	91	64	536	2.59	1.29	3.64	5	.0
April	84.9	72.0	78.5	92	66	555	3.52	1.52	5.13	7	.0
May	86.3	73.5	79.9	93	69	617	5.89	2.20	8.85	10	.0
June	87.7	74.8	81.3	93	71	639	5.11	2.67	7.09	10	.0
July	87.6	75.7	81.7	92	72	673	4.82	2.78	6.47	11	.0
August	88.1	75.7	81.9	93	72	679	6.27	4.49	7.90	12	.0
September	88.2	75.1	81.7	93	72	651	5.19	3.48	6.75	11	.0
October	87.7	74.4	81.1	93	70	654	5.88	3.36	7.93	10	.0
November	85.4	72.9	79.2	91	67	576	5.14	3.28	6.82	11	.0
December	83.3	71.3	77.3	89	66	536	4.86	2.77	6.56	10	.0
Year	85.7	72.9	79.4	94	63	7,072	54.63	44.96	63.50	111	.0

[1]Recorded in the period 1955-74 at San Juan, P. R.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (60° F).

TABLE 2.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	76.1	60.2	68.2	82	56	254	3.80	2.12	5.17	10	.0
February---	77.5	59.8	68.7	83	55	244	2.13	1.35	2.83	6	.0
March------	78.9	60.7	69.8	84	56	304	3.29	1.85	4.46	6	.0
April------	80.1	61.6	70.9	85	56	327	4.27	1.68	6.36	7	.0
May--------	81.0	63.5	72.3	87	59	381	6.50	2.65	9.61	9	.0
June-------	82.0	65.4	73.7	86	62	411	3.39	1.88	4.62	8	.0
July-------	82.5	66.1	74.3	87	62	443	3.31	2.00	4.47	7	.0
August-----	82.5	66.5	74.5	88	61	450	5.18	3.43	6.77	8	.0
September--	82.7	66.0	74.4	86	61	432	5.22	3.74	6.58	9	.0
October----	81.9	66.2	74.1	88	61	437	9.03	3.80	13.27	12	.0
November---	79.7	64.2	71.9	84	59	357	6.95	3.28	9.93	10	.0
December---	77.1	61.6	69.4	84	57	291	4.03	1.77	5.85	7	.0
Year-----	80.2	63.5	71.9	89	55	4,331	57.10	39.74	73.55	99	.0

[1]Recorded in the period 1963-74 at Barranquitas, P. R.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (60° F).

TABLE 3.--MAP UNITS AND THEIR POTENTIAL AND LIMITATIONS FOR SPECIFIED USE

Map unit	Extent of area	Cultivated farm crops	Specialty crops	Woodland	Urban Uses	Intensive recreation areas	Extensive recreation areas
	Pct						
1. Maricao-Los Guineos	10	Poor: slope.	Poor: slope.	Good-------	Poor: slope, too clayey.	Poor: slope, too clayey.	Good.
2. Humatas-Naranjito-Consumo	29	Poor: slope.	Poor: slope.	Good-------	Poor: slope, too clayey.	Poor: slope, too clayey.	Good.
3. Mucara-Caguabo	39	Poor: slope, depth to rock.	Poor: slope, depth to rock.	Poor: depth to rock.	Poor: slope, depth to rock.	Poor: slope, depth to rock.	Good.
4. Descalabrado	1	Poor: slope, depth to rock.	Poor: slope, depth to rock.	Poor: depth to rock.	Poor: slope, depth to rock.	Poor: slope, depth to rock.	Good.
5. Pandura-Lirios	7	Poor: slope.	Poor: slope.	Good-------	Poor: slope.	Poor: slope.	Good.
6. Tanama-Colinas-Soller	4	Poor: slope, depth to rock.	Poor: slope, depth to rock.	Poor: depth to rock.	Poor: slope, depth to rock.	Poor: slope, depth to rock.	Good.
7. Almirante-Vega Alta-Matanzas	3	Good-------	Good-------	Good-------	Good-------	Good---------	Good.
8. Toa-Bajura-Coloso	4	Good-------	Good-------	Good-------	Poor: wetness, flooding.	Poor: wetness, flooding.	Good.
9. Mabi-Rio Arriba	2	Fair: wetness.	Fair: wetness.	Good-------	Poor: wetness, shrink-swell.	Poor: wetness, too clayey.	Good.
10. Martin Pena-Saladar-Hydraquents	1	Poor: wetness, flooding.	Poor: wetness, flooding.	Poor: wetness, flooding.	Poor: wetness, flooding.	Poor: wetness, flooding.	Good.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AaB	Aceitunas clay, 2 to 5 percent slopes	575	0.1
AaC	Aceitunas clay, 5 to 12 percent slopes	4,328	1.0
AbD	Aibonito clay, 12 to 20 percent slopes	276	0.1
AbE	Aibonito clay, 20 to 40 percent slopes	803	0.2
AmB	Almirante clay, 2 to 5 percent slopes	4,280	1.0
AmC	Almirante clay, 5 to 12 percent slopes	1,098	0.2
Ba	Bajura clay	4,148	0.9
BmB	Bayamon clay, 2 to 5 percent slopes	647	0.1
CaE	Caguabo clay loam, 20 to 40 percent slopes	3,674	0.8
CaF	Caguabo clay loam, 40 to 60 percent slopes	51,494	11.5
CbF	Caguabo-Rock outcrop complex, 40 to 60 percent slopes	2,324	0.5
Ce	Candelero loam	607	0.1
ClC	Catalina clay, 4 to 12 percent slopes	267	0.1
Cn	Catano loamy sand	252	0.1
Co	Cayagua sandy loam	1,822	0.4
CrD2	Colinas clay loam, 12 to 20 percent slopes, eroded	1,165	0.3
CrE2	Colinas clay loam, 20 to 40 percent slopes, eroded	2,802	0.6
CrF2	Colinas clay loam, 40 to 60 percent slopes, eroded	894	0.2
Cs	Coloso silty clay loam	2,640	0.6
CuE	Consumo clay, 20 to 40 percent slopes	2,382	0.5
CuF	Consumo clay, 40 to 60 percent slopes	17,118	3.8
CzC	Corozal clay, 5 to 12 percent slopes	219	0.1
DaC	Daguey clay, 2 to 12 percent slopes	106	(1)
DaD	Daguey clay, 12 to 20 percent slopes	6,729	1.5
DeF	Descalabrado clay loam, 40 to 60 percent slopes	1,785	0.4
DgF	Descalabrado-Rock outcrop complex, 40 to 60 percent slopes	1,239	0.3
Dm	Dique loam	296	0.1
Dr	Durados sandy loam	448	0.1
Es	Estacion silty clay loam	1,624	0.4
GuF	Guayama clay loam, 20 to 60 percent slopes	266	0.1
Hm	Humacao loam	78	(1)
HtE	Humatas clay, 20 to 40 percent slopes	19,364	4.3
HtF	Humatas clay, 40 to 60 percent slopes	21,105	4.7
HuF	Humatas-Rock outcrop complex, 20 to 60 percent slopes	1,022	0.2
Hy	Hydraquents, saline	624	0.1
JaE2	Jagueyes loam, 20 to 40 percent slopes, eroded	200	(1)
JnD2	Juncal clay, 5 to 20 percent slopes, eroded	524	0.1
JuC	Juncos clay, 5 to 12 percent slopes	754	0.2
JuD	Juncos clay, 12 to 20 percent slopes	1,272	0.3
LaB	Lares clay, 2 to 5 percent slopes	205	(1)
LaC2	Lares clay, 5 to 12 percent slopes, eroded	1,841	0.4
LmE	Limones clay, 20 to 40 percent slopes	384	0.1
LmF	Limones clay, 40 to 60 percent slopes	314	0.1
LoF2	Lirios silty clay loam, 20 to 60 percent slopes, eroded	7,346	1.6
LsE	Los Guineos clay, 20 to 40 percent slopes	3,474	0.8
LsF	Los Guineos clay, 40 to 60 percent slopes	14,588	3.3
MaA	Mabi clay, 0 to 2 percent slopes	274	0.1
MaB	Mabi clay, 2 to 5 percent slopes	2,440	0.5
MaC	Mabi clay, 5 to 12 percent slopes	2,785	0.6
Md	Made land	245	0.1
MlF	Malaya clay loam, 40 to 60 percent slopes	480	0.1
MoF	Maricao clay, 20 to 60 percent slopes	22,515	5.0
Mp	Martin Pena muck	2,339	0.5
MsB	Matanzas clay, 2 to 5 percent slopes	1,031	0.2
MtB	Montegrande clay, 2 to 5 percent slopes	72	(1)
MtC	Montegrande clay, 5 to 12 percent slopes	390	0.1
MuF2	Morado clay loam, 40 to 60 percent slopes, eroded	2,471	0.6
MxD	Mucara clay, 12 to 20 percent slopes	2,442	0.5
MxE	Mucara clay, 20 to 40 percent slopes	16,920	3.8
MxF	Mucara clay, 40 to 60 percent slopes	70,480	15.8
NaD2	Naranjito silty clay loam, 12 to 20 percent slopes, eroded	1,148	0.3
NaE2	Naranjito silty clay loam, 20 to 40 percent slopes, eroded	5,594	1.3
NaF2	Naranjito silty clay loam, 40 to 60 percent slopes, eroded	25,999	5.8
PaD	Pandura sandy loam, 12 to 20 percent slopes	1,524	0.3
PaE	Pandura sandy loam, 20 to 40 percent slopes	2,967	0.7
PaF	Pandura sandy loam, 40 to 60 percent slopes	13,171	2.9
PeF	Pellejas clay loam, 40 to 60 percent slopes	617	0.1
Re	Reilly sandy loam	539	0.1
RoB	Rio Arriba clay, 2 to 5 percent slopes	1,693	0.4
RoC2	Rio Arriba clay, 5 to 12 percent slopes, eroded	2,479	0.6

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
RpD2	Rio Piedras clay, 12 to 20 percent slopes, eroded	1,276	0.3
RpE2	Rio Piedras clay, 20 to 40 percent slopes, eroded	869	0.2
RpF2	Rio Piedras clay, 40 to 60 percent slopes, eroded	1,209	0.3
SaF	Sabana silty clay loam, 40 to 60 percent slopes	799	0.2
ScB	Sabana Seca clay, 2 to 8 percent slopes	590	0.1
Sm	Saladar muck	2,719	0.6
SoE	Soller clay loam, 20 to 40 percent slopes	673	0.2
SoF	Soller clay loam, 40 to 60 percent slopes	4,070	0.9
TaF	Tanama-Rock outcrop complex, 20 to 60 percent slopes	6,575	1.5
To	Toa silty clay loam	4,983	1.1
TrB	Torres loamy sand, 2 to 5 percent slopes	694	0.2
Ts	Tropopsamments	61	(1)
Ud	Urban land-Durados complex	3,461	0.8
Um	Urban land-Mucara complex	4,142	0.9
Us	Urban land-Sabana Seca complex	5,040	1.1
Uv	Urban land-Vega Alta complex	14,048	3.1
VaB	Vega Alta clay loam, 2 to 5 percent slopes	365	0.1
VaC2	Vega Alta clay loam, 5 to 12 percent slopes, eroded	1,696	0.4
Vg	Vega Baja silty clay	48	(1)
VkC2	Via clay loam, 5 to 12 percent slopes, eroded	413	0.1
Vv	Vivi loam	165	(1)
YeE	Yunes silty clay loam, 20 to 40 percent slopes	462	0.1
YeF	Yunes silty clay loam, 40 to 60 percent slopes	778	0.2
	Riverwash	524	0.1
	Urban areas	20,614	4.6
	Water	987	0.2
	Total	447,279	100.0

[1]Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management in 1974. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Sugarcane, 18 month	Sugarcane, spring	Sugarcane, ratoon	Plantains	Coffee	Pangola-grass	Merker grass
	Ton	Ton	Ton	Thousand	Cwt	Ton[1]	Ton[1]
Aceitunas:							
AaB	60	50	40	35	---	24	19
AaC	60	50	40	35	---	24	17
Aibonito:							
AbD	---	---	---	25	5	21	14
AbE	---	---	---	20	4	21	---
Almirante:							
AmB	60	50	40	35	---	---	19
AmC	60	50	40	35	---	---	17
Bajura:							
Ba	---	45	30	---	---	---	15
Bayamon:							
BmB	60	50	40	35	---	24	19
Caguabo:							
CaE, CaF	---	---	---	---	---	6	---
[2]CbF	---	---	---	---	---	---	---
Candelero:							
Ce	45	35	30	---	---	24	17
Catalina:							
ClC	60	50	40	35	12	21	17
Catano:							
Cn	---	---	---	---	---	20	12
Cayagua:							
Co	50	40	35	---	---	24	16
Colinas:							
CrD2	45	35	30	---	---	17	13
CrE2	---	---	---	---	---	17	---
CrF2	---	---	---	---	---	12	---
Coloso:							
Cs	60	50	40	---	---	---	18
Consumo:							
CuE	---	---	---	25	8	21	---
CuF	---	---	---	---	6	14	---
Corozal:							
CzC	60	50	40	35	12	24	17
Daguey:							
DaC, DaD	45	40	30	35	12	24	16
Descalabrado:							
DeF	---	---	---	---	---	---	---
[2]DgF	---	---	---	---	---	---	---
Dique:							
Dm	80	60	40	---	---	24	20

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Sugarcane, 18 month	Sugarcane, spring	Sugarcane, ratoon	Plantains	Coffee	Pangola-grass	Merker grass
	Ton	Ton	Ton	Thousand	Cwt	Ton[1]	Ton[1]
Durados:							
Dr	---	---	---	---	---	20	12
Estacion:							
Es	60	50	40	---	---	2	17
Guayama:							
GuF	---	---	---	---	---	---	---
Humacao:							
Hm	60	50	40	35	---	24	19
Humatas:							
HtE	---	---	---	30	10	21	---
HtF	---	---	---	---	8	21	---
[2]HuF	---	---	---	---	---	---	---
Hydraquents:							
Hy	---	---	---	---	---	---	---
Jagueyes:							
JaE2	---	---	---	30	10	---	---
Juncal:							
JnD2	---	45	35	35	---	17	15
Juncos:							
JuC	---	40	35	35	7	24	15
JuD	---	35	30	30	7	24	14
Lares:							
LaB	45	40	35	35	12	24	19
LaC2	45	40	35	35	12	24	17
Limones:							
LmE	---	---	---	30	10	---	---
LmF	---	---	---	---	8	---	---
Lirios:							
LoF2	---	---	---	---	6	24	---
Los Guineos:							
LsE	---	---	---	25	8	20	---
LsF	---	---	---	---	6	---	---
Mabi:							
MaA	55	45	35	---	---	24	16
MaB	55	45	35	---	---	24	16
MaC	50	40	35	30	---	24	15
Made land:							
Md.							
Malaya:							
MlF	---	---	---	---	---	12	---
Maricao:							
MoF	---	---	---	---	6	20	---
Martin Pena:							
Mp	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Sugarcane, 18 month	Sugarcane, spring	Sugarcane, ratoon	Plantains	Coffee	Pangola-grass	Merker grass
	Ton	Ton	Ton	Thousand	Cwt	Ton[1]	Ton[1]
Matanzas:							
MsB	60	50	40	35	---	24	19
Montegrande:							
MtB	55	45	35	---	---	---	16
MtC	55	45	35	30	---	---	15
Morado:							
MuF2	---	---	---	---	5	12	---
Mucara:							
MxD	---	35	30	30	7	24	14
MxE	---	---	---	25	6	12	---
MxF	---	---	---	---	5	12	---
Naranjito:							
NaD2	---	35	30	30	7	21	14
NaE2	---	---	---	25	6	21	---
NaF2	---	---	---	---	5	15	---
Pandura:							
PaD	---	35	30	25	---	11	12
PaE, PaF	---	---	---	---	---	8	---
Pellejas:							
PeF	---	---	---	---	6	11	---
Reilly:							
Re	---	35	30	---	---	24	15
Rio Arriba:							
RoB	55	45	35	---	---	---	16
RoC2	50	40	35	30	---	---	15
Rio Piedras:							
RpD2	---	35	30	30	10	24	13
RpE2	---	---	---	25	8	21	---
RpF2	---	---	---	---	6	21	---
Sabana:							
SaF	---	---	---	---	---	12	---
Sabana Seca:							
ScB	---	---	---	---	---	2	14
Saladar:							
Sm	---	---	---	---	---	---	---
Soller:							
SoE, SoF	---	---	---	---	---	12	---
Tanama:							
[2]TaF	---	---	---	---	---	---	---
Toa:							
To	80	60	50	---	---	24	20
Torres:							
TrB	---	---	---	---	---	1.6	10

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Sugarcane, 18 month	Sugarcane, spring	Sugarcane, ratoon	Plantains	Coffee	Pangola-grass	Merker grass
	Ton	Ton	Ton	Thousand	Cwt	Ton[1]	Ton[1]
Tropopsamments:							
Ts	---	---	---	---	---	---	---
Urban land:							
[2]Ud	---	---	---	---	---	---	---
[2]Um	---	---	---	---	---	---	---
[2]Us	---	---	---	---	---	---	---
[2]Uv	---	---	---	---	---	---	---
Vega Alta:							
VaB	60	50	40	35	---	---	19
VaC2	60	50	40	35	---	---	17
Vega Baja:							
Vg	55	45	40	---	---	---	16
Via:							
VkC2	50	45	40	---	---	24	17
Vivi:							
Vv	60	50	40	---	---	---	16
Yunes:							
YeE, YeF	---	---	---	---	6	20	---

[1]Dry weight per acre per year.
[2]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas excluded. Absence of an entry means no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	5,279	---	---	---
II	14,513	7,181	5,474	1,858
III	32,420	26,058	4,738	1,624
IV	29,590	29,051	---	539
V	---	---	---	---
VI	65,970	64,576	---	1,394
VII	244,718	173,805	2,339	68,574
VIII	5,728	---	3,343	2,385

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry in a column means the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Important trees	Average yearly growth per acre	
						Bd ft	
Aibonito:							
AbD	2c	Slight	Moderate	Slight	Honduras pine	1200	Honduras pine, honduras mahogany, kadam, mahoe, robusta eucalyptus.
AbE	2c	Moderate	Moderate	Slight	Honduras pine	1200	Honduras pine, robusta eucalyptus.
Caguabo:							
CaE	3d	Severe	Severe	Slight	Honduras pine	800	Honduras pine, robusta eucalyptus.
CaF	4d	Severe	Severe	Severe	Honduras pine	700	Honduras pine.
[1]CbF:							
Caguabo part	4d	Severe	Severe	Severe	Honduras pine	700	Honduras pine.
Rock outcrop part.							
Catalina:							
ClC	2c	Slight	Moderate	Slight	Honduras pine	1100	Honduras pine, honduras mahogany, kadam, robusta eucalyptus, mahoe.
Colinas:							
CrD2	2d	Slight	Slight	Slight	Honduras mahogany	450	Honduras pine, honduras mahogany, mahoe, teak.
CrE2	3d	Moderate	Moderate	----	Honduras mahogany	350	Honduras mahogony.
Consumo:							
CuE	2c	Moderate	Moderate	Slight	Honduras pine	1100	Honduras pine, robusta eucalyptus.
CuF	3c	Severe	Severe	Slight	Honduras pine	1000	Honduras pine, robusta eucalyptus.
Daguey:							
DaC, DaD	2c	Slight	Moderate	Slight	Honduras pine	1300	Honduras pine, honduras mahogany, kadam, mahoe, robusta eucalyptus.
Descalabrado:							
DeF	4d	Severe	Severe	Severe	Honduras pine	<800	Honduras pine.
[1]DgF:							
Descalabrado part	4d	Severe	Severe	Severe	Honduras pine	<800	Honduras pine.
Rock outcrop part.							
Guayama:							
GuF	4d	Moderate	Moderate	Severe	Honduras pine	<800	Honduras pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Important trees	Average yearly growth per acre	
						Bd ft	
Humatas:							
HtE	2c	Moderate	Moderate	Slight	Honduras pine	1100	Honduras pine, robusta eucalyptus.
HtF	3c	Severe	Severe	Slight	Honduras pine	1000	Honduras pine, robusta eucalyptus.
[1]HuF:							
Humatas part	3c	Severe	Severe	Slight	Honduras pine	1000	Honduras pine, robusta eucalyptus.
Rock outcrop part.							
Jagueyes:							
JaE2	2r	Moderate	Moderate	Moderate	Honduras pine	1200	Honduras pine.
Juncal:							
JnD2	2c	Slight	Slight	Slight	Honduras pine Honduras mahogany	1200 450	Honduras pine, honduras mahogany.
Juncos:							
JuC	3d	Slight	Moderate	Slight	Honduras pine	1000	Honduras pine, robusta eucalyptus, honduras mahogany.
JuD	3d	Slight	Moderate	Slight	Honduras pine	1000	Honduras pine, robusta eucalyptus, honduras mahogany.
Lares:							
LaB, LaC2	2c	Slight	Moderate	Slight	Honduras pine	1300	Honduras pine, honduras mahogany, kadam, mahoe, robusta eucalyptus.
Limones:							
LmE	2c	Moderate	Moderate	Moderate	Honduras pine	1300	Honduras pine.
LmF	3c	Severe	Severe	Moderate	Honduras pine	1000	Honduras pine.
Lirios:							
LoF2	2c	Moderate	Moderate	Slight	Honduras pine	1100	Honduras pine, robusta eucalyptus.
Los Guineos:							
LsE, LsF	2c	Moderate	Moderate	Slight	Honduras pine	1400	Honduras pine, robusta eucalyptus.
Malaya:							
MlF	4d	Moderate	Moderate	Slight	Honduras pine	700	Honduras pine, robusta eucalyptus.
Maricao:							
MoF	2c	Moderate	Moderate	Slight	Honduras pine	1300	Honduras pine, robusta eucalyptus.
Morado:							
MuF2	3d	Severe	Severe	Slight	Honduras pine	900	Honduras pine, robusta eucalyptus.
Mucara:							
MxD	3d	Slight	Moderate	Slight	Honduras pine	1000	Honduras pine, robusta eucalyptus, honduras mahogany.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Important trees	Average yearly growth per acre	
						Bd ft	
Mucara:							
MxE	3d	Moderate	Moderate	Slight	Honduras pine	900	Honduras pine, robusta eucalyptus.
MxF	3d	Severe	Severe	Slight	Honduras pine	900	Honduras pine, robusta eucalyptus.
Naranjito:							
NaD2, NaE2	2c	Slight	Moderate	Slight	Honduras pine	1100	Honduras pine, honduras mahogany, kadam, mahoe, robusta eucalyptus.
NaF2	3c	Severe	Severe	Slight	Honduras pine	900	Honduras pine, robusta eucalyptus.
Pandura:							
PaD	2o	Moderate	Slight	Slight	Honduras pine	1200	Honduras pine, robusta eucalyptus, mahoe.
PaE	2r	Severe	Moderate	Slight	Honduras pine	1100	Honduras pine, robusta eucalyptus, mahoe.
PaF	3r	Severe	Severe	Slight	Honduras pine	900	Honduras pine, robusta eucalyptus.
Pellejas:							
PeF	3r	Severe	Severe	Slight	Honduras pine	900	Honduras pine, robusta eucalyptus.
Rio Piedras:							
RpD2	2c	Slight	Moderate	Slight	Honduras pine Honduras pine	1300 1300	Honduras pine, honduras mahogany, kadam, mahoe, robusta eucalyptus.
RpE2	2c	Moderate	Moderate	Slight	Honduras pine Honduras pine	1100 1000	Honduras pine, robusta eucalyptus.
RpF2	3c	Severe	Severe	Slight	Honduras pine Honduras pine	1100 1000	Honduras pine, robusta eucalyptus.
Sabana:							
SaF	4d	Moderate	Severe	Slight	Honduras pine	700	Honduras pine, robusta eucalyptus.
Soller:							
SoE	4d	Moderate	Moderate	Slight	Honduras mahogany	350	Honduras mahogany.
SoF	4d	Severe	Severe	Severe	Honduras mahogany	350	Honduras mahogany.
Urban land:							
[1]Um:							
Urban land part.							
Mucara part	3d	Moderate	Moderate	Slight	Honduras pine	900	Honduras pine, robusta eucalyptus.
Yunes:							
YeE, YeF	4d	Moderate	Severe	Slight	Honduras pine	700	Honduras pine, robusta eucalyptus.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Aceitunas:				
AaB	Moderate: too clayey.	Moderate: low strength.	Moderate: corrosive, low strengtn.	Moderate: low strength.
AaC	Moderate: slope, too clayey.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.
Aibonito:				
AbD, AbE	Severe: slope.	Severe: slope.	Severe: slope, corrosive, low strength.	Severe: slope.
Almirante:				
AmB	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.
AmC	Moderate: slope, too clayey.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
Bajura:				
Ba	Severe: floods, too clayey, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.
Bayamon:				
BmB	Moderate: too clayey.	Slight	Slight	Moderate: low strength.
Caguabo:				
CaE, CaF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
[1]CbF:				
Caguabo part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop part.				
Candelero:				
Ce	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Moderate: wetness, low strength.
Catalina:				
ClC	Moderate: slope, too clayey.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.
Catano:				
Cn	Severe: cutbanks cave.	Slight	Slight	Slight.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Cayagua:				
Co	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
Colinas:				
CrD2, CrE2, CrF2	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Coloso:				
Cs	Severe: floods, too clayey, wetness.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell, corrosive.	Severe: floods, shrink-swell, low strength.
Consumo:				
CuE, CuF	Severe: slope, too clayey.	Severe: slope, low strength.	Severe: slope, low strength, corrosive.	Severe: slope, low strength.
Corozal:				
CzC	Severe: too clayey, wetness.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell, wetness.
Daguey:				
DaC	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: slope, corrosive, shrink-swell.	Moderate: low strength, shrink-swell.
DaD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Descalabrado:				
DeF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
[1]DgF:				
Descalabrado part-	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop part.				
Dique:				
Dm	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Durados:				
Dr	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Moderate: floods.
Estacion:				
Es	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Guayama:				
GuF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Humacao:				
Hm	Slight	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Moderate: shrink-swell low strength.
Humatas:				
HtE, HtF	Severe: slope.	Severe: slope.	Severe: slope, corrosive.	Severe: slope.
[1]HuF:				
Humatas part	Severe: slope.	Severe: slope.	Severe: slope, corrosive.	Severe: slope.
Rock outcrop part.				
Hydraquents:				
Hy	Severe: floods, wetness.	Severe: floods, low strength, wetness.	Severe: corrosive, floods, low strength.	Severe: floods, low strength, wetness.
Jagueyes:				
JaE2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Juncal:				
JnD2	Moderate: slope, hard to pack, too clayey.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
Juncos:				
JuC	Severe: too clayey.	Severe: low strength, shrink-swell.	Severe: slope, low strength, shrink-swell.	Severe: low strength, shrink-swell.
JuD	Severe: slope, too clayey.	Severe: slope, low strength, shrink-swell.	Severe: slope, low strength, shrink-swell.	Severe: slope, low strength, shrink-swell.
Lares:				
LaB	Severe: too clayey, wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: low strength, shrink-swell, corrosive.	Severe: low strength.
LaC2	Severe: too clayey, wetness.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.
Limones:				
LmE, LmF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lirios:				
LoF2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Los Guineos:				
LsE, LsF	Severe: slope, too clayey.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Mabi:				
MaA, MaB	Severe: too clayey, wetness.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell, wetness.	Severe: shrink-swell.
MaC	Severe: too clayey, wetness.	Severe: floods, shrink-swell.	Severe: slope, shrink-swell, wetness.	Severe: shrink-swell.
Made land:				
Md.				
Malaya:				
MlF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Maricao:				
MoF	Severe: slope.	Severe: slope.	Severe: slope, corrosive.	Severe: slope.
Martin Pena:				
Mp	Severe: floods, too clayey, wetness.	Severe: floods, shrink-swell, wetness.	Severe: corrosive, floods, shrink-swell.	Severe: floods, shrink-swell, wetness.
Matanzas:				
MsB	Moderate: depth to rock, too clayey.	Slight	Slight	Moderate: low strength.
Montegrande:				
MtB	Severe: too clayey, small stones.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, corrosive.	Severe: low strength, shrink-swell.
MtC	Severe: too clayey, small stones.	Severe: floods, shrink-swell, low strength.	Severe: slope, shrink-swell, corrosive.	Severe: low strength, shrink-swell.
Morado:				
MuF2	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
Mucara:				
MxD, MxE, MxF	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
Naranjito:				
NaD2, NaE2, NaF2	Severe: slope.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength, shrink-swell.
Pandura:				
PaD, PaE, PaF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pellejas:				
PeF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Reilly:				
Re	Severe: cutbanks cave, floods, small stones.	Severe: floods.	Severe: floods.	Severe: floods.
Rio Arriba:				
RoB, RoC2	Severe: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: shrink-swell.
Rio Piedras:				
RpD2, RpE2, RpF2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sabana:				
SaF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Sabana Seca:				
ScB	Severe: too clayey, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.
Saladar:				
Sm	Severe: excess humus, floods, wetness.	Severe: excess humus, floods, wetness.	Severe: excess humus, floods, wetness.	Severe: excess humus, floods, wetness.
Soller:				
SoE, SoF	Severe: slope, depth to rock, too clayey.	Severe: slope.	Severe: slope.	Severe: slope, low strength, depth to rock.
Tanama:				
[1]TaF:				
Tanama part	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock, low strengtn.	Severe: slope, depth to rock, corrosive.	Severe: slope, depth to rock, low strengtn.
Rock outcrop part.				
Toa:				
To	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Torres:				
TrB	Moderate: too clayey.	Slight	Moderate: corrosive.	Slight.
Tropopsamments:				
Ts	Severe: cutbanks cave, floods, wetness.	Severe: floods, wetness.	Severe: corrosive, floods, wetness.	Severe: floods, wetness.
Urban land:				
[1]Ud:				
Urban land part.				
Durados part	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Moderate: floods.
[1]Um:				
Urban land part.				

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Urban land: Mucara part	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
[1]Us: Urban land part.				
Sabana Seca part	Severe: too clayey, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.
[1]Uv: Urban land part.				
Vega Alta part	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: corrosive, low strength, shrink-swell.	Moderate: low strength, shrink-swell.
Vega Alta: VaB	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: corrosive, low strength, shrink-swell.	Moderate: low strength, shrink-swell.
VaC2	Moderate: slope, too clayey.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
Vega Baja: Vg	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Via: VkC2	Moderate: slope, too clayey, small stones.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
Vivi: Vv	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Yunes: YeE, YeF	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 9.--SANITARY FACILITIES

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Aceitunas:					
AaB	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
AaC	Moderate: slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
Aibonito:					
AbD	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.
AbE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Almirante:					
AmB	Slight	Moderate: slope.	Moderate: too clayey.	Slight	Fair: hard to pack, too clayey.
AmC	Moderate: slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Poor: slope, hard to pack, too clayey.
Bajura:					
Ba	Severe: floods, percs slowly, wetness.	Severe: floods, wetness.	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: hard to pack, too clayey, wetness.
Bayamon:					
BmB	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: hard to pack, too clayey.
Caguabo:					
CaE, CaF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, small stones.
[1]CbF:					
Caguabo part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, small stones.
Rock outcrop part.					
Candelero:					
Ce	Severe: wetness, percs slowly.	Severe: slope, floods.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
Catalina:					
ClC	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: hard to pack, too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Catano:					
Cn	Slight	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: seepage, too sandy.
Cayagua:					
Co	Moderate: slope, wetness.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage, wetness.	Fair: slope.
Colinas:					
CrD2	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
CrE2, CrF2	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope.
Coloso:					
Cs	Severe: floods, percs slowly, wetness.	Severe: floods, wetness.	Severe: floods, too clayey.	Severe: floods.	Fair: too clayey, area reclaim.
Consumo:					
CuE, CuF	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, hard to pack.
Corozal:					
CzC	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Moderate: wetness.	Poor: hard to pack, too clayey.
Daguey:					
DaC	Slight	Severe: slope.	Moderate: too clayey.	Slignt	Fair: hard to pack, too clayey.
DaD	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.
Descalabrado:					
DeF	Severe: slope, deptn to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.
[1]DgF:					
Descalabrado part.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.
Rock outcrop part.					
Dique:					
Dm	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Durados:					
Dr	Moderate: floods.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, area reclaim.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Estacion:					
Es	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: area reclaim, thin layer.
Guayama:					
GuF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Humacao:					
Hm	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Humatas:					
HtE, HtF	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope.
[1]HuF:					
Humatas part	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope.
Rock outcrop part.					
Hydraquents:					
Hy	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Jagueyes:					
JaE2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Juncal:					
JnD2	Moderate: slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, hard to pack, too clayey.
Juncos:					
JuC	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey, hard to pack.
JuD	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, hard to pack.
Lares:					
LaB	Moderate: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
LaC2	Moderate: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
Limones:					
LmE, LmF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lirios:					
LoF2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Los Guineos: LsE, LsF	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, hard to pack.
Mabi: MaA	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: floods, wetness.	Poor: hard to pack, too clayey.
MaB	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: floods, wetness.	Poor: hard to pack, too clayey.
MaC	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope, floods, wetness.	Poor: hard to pack, too clayey.
Made land: Md.					
Malaya: MlF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.
Maricao: MoF	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, hard to pack, too clayey.
Martin Pena: Mp	Severe: floods, percs slowly, wetness.	Severe: floods, wetness.	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: hard to pack, too clayey, wetness.
Matanzas: MsB	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Slight	Fair: hard to pack, too clayey.
Montegrande: MtB	Moderate: floods, percs slowly.	Moderate: slope, seepage.	Severe: too clayey.	Moderate: floods.	Poor: hard to pack, too clayey.
MtC	Moderate: slope, floods, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope, floods.	Poor: hard to pack, too clayey.
Morado: MuF2	Severe: slope, deptn to rock.	Severe: slope, seepage, deptn to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope.
Mucara: MxD	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Mucara:					
MxE, MxF	Severe: slope, depth to rock.	Severe: slope, deptn to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, tnin layer, too clayey.
Naranjito:					
NaD2	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope, too clayey.
NaE2, NaF2	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, too clayey.
Pandura:					
PaD	Severe: slope.	Severe: slope, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer.
PaE, PaF	Severe: slope.	Severe: slope, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer.
Pellejas:					
PeF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Reilly:					
Re	Severe: floods.	Severe: floods, seepage, small stones.	Severe: floods, seepage, small stones.	Severe: floods, seepage.	Poor: seepage, small stones, thin layer.
Rio Arriba:					
RoB, RoC2	Severe: perc slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: hard to pack, too clayey.
Rio Piedras:					
RpD2	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.
RpE2, RpF2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sabana:					
SaF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.
Sabana Seca:					
ScB	Severe: perc slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness.
Saladar:					
Sm	Severe: floods, perc slowly, wetness.	Severe: excess humus, floods, wetness.	Severe: excess humus, floods, wetness.	Severe: floods, wetness.	Poor: excess humus, wetness.
Soller:					
SoE, SoF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: slope, thin layer, area reclaim.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Tanama:					
[1]TaF:					
Tanama part	Severe: slope, deptn to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop part.					
Toa:					
To	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Torres:					
TrB	Moderate: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Tropopsamments:					
Ts	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, too sandy, wetness.	Severe: floods, wetness.	Poor: too sandy.
Urban land:					
[1]Ud:					
Urban land part.					
Durados part	Moderate: floods.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, area reclaim.
[1]Um:					
Urban land part.					
Mucara part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, deptn to rock.	Severe: slope.	Poor: slope, thin layer, too clayey.
[1]Us:					
Urban land part.					
Sabana Seca part	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness.
[1]Uv:					
Urban land part.					
Vega Alta part	Moderate: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Fair: hard to pack, too clayey.
Vega Alta:					
VaB	Moderate: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Fair: hard to pack, too clayey.
VaC2	Moderate: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Fair: slope, hard to pack, too clayey.
Vega Baja:					
Vg	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, too clayey.	Severe: floods, wetness.	Poor: area reclaim, hard to pack, too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Via: VkC2	Moderate: slope.	Severe: slope.	Severe: seepage.	Severe: seepage.	Fair: slope, too clayey, small stones.
Vivi: Vv	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Yunes: YeE, YeF	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 10.--CONSTRUCTION MATERIALS

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Aceitunas:				
AaB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
AaC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey.
Aibonito:				
AbD	Fair: slope, low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
AbE	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Almirante:				
AmB	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: low strength, shrink-swell.
AmC	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, low strength, shrink-swell.
Bajura:				
Ba	Poor: shrink-swell, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
Bayamon:				
BmB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: low strength.
Caguabo:				
CaE, CaF	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer.
[1]CbF:				
Caguabo part	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer.
Rock outcrop part.				
Candelero:				
Ce	Fair: shrink-swell, wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Catalina:				
ClC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey.
Catano:				
Cn	Good	Good	Unsuited: excess fines.	Poor: too sandy.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Cayagua:				
Co	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Colinas:				
CrD2	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
CrE2, CrF2	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Coloso:				
Cs	Poor: area reclaim, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Consumo:				
CuE, CuF	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Corozal:				
CzC	Fair: low strength, shrink-swell, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, wetness.
Daguey:				
DaC	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
DaD	Fair: slope, low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Descalabrado:				
DeF	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim, thin layer.
[1]DgF:				
Descalabrado part.	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim, thin layer.
Rock outcrop part.				
Dique:				
Dm	Good	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Durados:				
Dr	Good	Good	Unsuited excess fines.	Poor: too sandy.
Estacion:				
Es	Good	Unsuited: excess fines.	Good	Poor: thin layer, small stones.
Guayama:				
GuF	Poor: slope, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim, thin layer.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Humacao: Hm	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines	Good.
Humatas: HtE, HtF	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
[1]HuF: Humatas part	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop part.				
Hydraquents: Hy	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt, wetness.
Jagueyes: JaE2	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Juncal: JnD2	Fair: area reclaim, low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, area reclaim, low strength.
Juncos: JuC	Poor: low strength, shrink-swell, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, area reclaim.
JuD	Poor: low strength, shrink-swell, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey, area reclaim.
Lares: LaB, LaC2	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Limones: LmE, LmF	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Lirios: LoF2	Poor: slope, low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Los Guineos: LsE, LsF	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Mabi: MaA, MaB, MaC	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Made land: Md.				

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Malaya: MlF	Poor: slope, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim, thin layer.
Maricao: MoF	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Martin Pena: Mp	Poor: excess humus, low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Matanzas: MsB	Fair: area reclaim, low strength, tnin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Montegrande: MtB, MtC	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Morado: MuF2	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Mucara: MxD	Poor: shrink-swell, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey, thin layer.
MxE, MxF	Poor: slope, shrink-swell, tnin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey, thin layer.
Naranjito: NaD2	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
NaE2, NaF2	Poor: slope, low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Pandura: PaD	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
PaE, PaF	Poor: slope, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
Pellejas: PeF	Poor: slope.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Reilly:				
Re	Good	Fair: excess fines.	Fair: excess fines.	Poor: small stones, thin layer.
Rio Arriba:				
RoB, RoC2	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Rio Piedras:				
RpD2	Fair: slope, area reclaim, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
RpE2, RpF2	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Sabana:				
SaF	Poor: slope, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim, thin layer.
Sabana Seca:				
ScB	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
Saladar:				
Sm	Poor: excess humus, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Soller:				
SoE, SoF	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
Tanama:				
[1]TaF:				
Tanama part	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim.
Rock outcrop part.				
Toa:				
To	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Torres:				
TrB	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Tropopsamments:				
Ts	Poor: area reclaim, wetness.	Good	Unsuited: excess fines.	Poor: excess lime, excess salt, too sandy.
Urban land:				
[1]Ud:				
Urban land part.				
Durados part	Good	Good	Unsuited: excess fines.	Poor: too sandy.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Urban land:				
[1]Um:				
Urban land part.				
Mucara part	Poor: slope, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey, thin layer.
[1]Us:				
Urban land part.				
Sabana Seca part	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
[1]Uv:				
Urban land part.				
Vega Alta part	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Vega Alta:				
VaB	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
VaC2	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey.
Vega Baja:				
Vg	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Via:				
VkC2	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, small stones.
Vivi:				
Vv	Good	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Yunes:				
YeE, YeF	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, small stones.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 11.--WATER MANAGEMENT

["Seepage," and some of the other terms that describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Aceitunas: AaB, AaC	Seepage, slope.	Compressible, low strength.	Not needed	Slope	Favorable.
Aibonito: AbD, AbE	Seepage, slope.	Compressible, low strength.	Not needed	Slope	Slope.
Almirante: AmB, AmC	Favorable	Compressible, hard to pack, low strength.	Not needed	Slope	Favorable.
Bajura: Ba	Slight	Compressible, hard to pack, shrink-swell.	Floods, percs slowly, poor outlets.	Percs slowly, poor outlets, wetness.	Not needed.
Bayamon: BmB	Seepage	Compressible, low strength, seepage.	Not needed	Slope	Favorable.
Caguabo: CaE, CaF	Depth to rock, slope.	Thin layer, low strength.	Not needed	Depth to rock, slope.	Erodes easily, slope.
[1]CbF: Caguabo part	Depth to rock, slope.	Thin layer, low strength.	Not needed	Depth to rock, slope.	Erodes easily, slope.
Rock outcrop part.					
Candelero: Ce	Slope	Low strength, compressible.	Percs slowly, wetness.	Percs slowly, slope, wetness.	Percs slowly, wetness.
Catalina: ClC	Seepage, slope.	Compressible, hard to pack, unstable fill.	Not needed	Complex slope	Favorable.
Catano: Cn	Seepage	Seepage, piping.	Not needed	Too sandy, piping.	Not needed.
Cayagua: Co	Seepage, slope.	Low strength, piping.	Complex slope	Slope	Slope.
Colinas: CrD2, CrE2, CrF2	Slope, seepage, cutbanks cave.	Hard to pack, seepage, piping, cutbanks cave.	Not needed	Piping, slope.	Slope.
Coloso: Cs	Favorable	Compressible, hard to pack, shrink-swell.	Floods, percs slowly, poor outlets.	Percs slowly, wetness.	Percs slowly, wetness.
Consumo: CuE, CuF	Slope, seepage.	Compressible, hard to pack, low strength.	Not needed	Slope	Slope.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Corozal: CzC	Favorable	Compressible, hard to pack, low strength.	Percs slowly, wetness.	Percs slowly, wetness.	Percs slowly, wetness.
Daguey: DaC, LaD	Seepage, slope.	Compressible, hard to pack, low strength.	Not needed	Slope	Slope.
Descalabrado: DeF	Slope, depth to rock.	Thin layer	Not needed	Slope, depth to rock, rooting depth.	Slope, rooting depth, droughty.
[1]DgF: Descalabrado part	Slope, depth to rock.	Thin layer	Not needed	Slope, depth to rock, rooting depth.	Slope, rooting depth, droughty.
Rock outcrop part.					
Dique: Dm	Seepage	Seepage, piping.	Not needed	Not needed	Favorable.
Durados: Dr	Seepage	Seepage, piping, unstable fill.	Not needed	Too sandy, piping.	Droughty.
Estacion: Es	Seepage	Seepage	Not needed	Not needed	Favorable.
Guayama: GuF	Slope, depth to rock.	Thin layer	Not needed	Slope, depth to rock, rooting depth.	Slope, rooting depth, droughty.
Humacao: Hm	Favorable	Favorable	Not needed	Favorable	Favorable.
Humatas: HtE, HtF	Slope, seepage.	Compressible, hard to pack, low strength.	Not needed	Slope	Slope.
[1]HuF: Humatas part	Slope, seepage.	Compressible, hard to pack, low strength.	Not needed	Slope	Slope.
Rock outcrop part.					
Hydraquents: Hy	Seepage	Hard to pack, low strengtn, unstable fill.	Excess salt, floods, wetness.	Not needed	Not needed.
Jagueyes: JaE2	Seepage, slope.	Low strengtn, piping, seepage.	Not needed	Slope	Slope.
Juncal: JnD2	Favorable	Compressible, low strengtn, shrink-swell.	Not needed	Slope	Slope.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Juncos: JuC, JuD	Slope	Compressible, hard to pack, shrink-swell.	Percs slowly	Complex slope, depth to rock, percs slowly.	Percs slowly.
Lares: LaB, LaC2	Favorable	Compressible, low strength, shrink-swell.	Not needed	Complex slope	Favorable.
Limones: LmE, LmF	Slope	Compressible, hard to pack, low strength.	Not needed	Slope	Slope.
Lirios: LoF2	Slope	Compressible, hard to pack, shrink-swell.	Not needed	Slope	Slope.
Los Guineos: LsE, LsF	Slope	Compressible, hard to pack, low strength.	Not needed	Slope	Slope.
Mabi: MaA, MaB, MaC	Favorable	Compressible, hard to pack, shrink-swell.	Floods, percs slowly.	Percs slowly, slope, wetness.	Percs slowly, slope, wetness.
Made land: Md.					
Malaya: MlF	Slope, depth to rock.	Thin layer	Not needed	Slope, depth to rock, rooting depth.	Slope, rooting depth.
Maricao: MoF	Slope	Compressible, hard to pack, low strength.	Not needed	Slope	Slope.
Martin Pena: Mp	Favorable	Compressible, hard to pack, shrink-swell.	Floods, percs slowly, poor outlets.	Percs slowly, poor outlets, wetness.	Percs slowly, wetness.
Matanzas: MsB	Depth to rock, seepage.	Compressible, hard to pack, thin layer.	Not needed	Not needed	Favorable.
Montegrande: MtB, MtC	Slope	Compressible, hard to pack, shrink-swell.	Not needed	Slope	Slope.
Morado: MuF2	Slope, depth to rock.	Compressible, hard to pack, thin layer.	Not needed	Slope, depth to rock.	Slope.
Mucara: MxD, MxE, MxF	Slope, depth to rock.	Shrink-swell, compressible, thin layer.	Not needed	Depth to rock, slope.	Slope, depth to rock.
Naranjito: NaD2, NaE2, NaF2	Slope, depth to rock.	Compressible, hard to pack, low strength.	Not needed	Depth to rock, slope.	Slope.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Pandura: PaD, PaE, PaF	Slope, depth to rock.	Seepage, thin layer.	Not needed	Depth to rock, slope.	Droughty, slope.
Pellejas: PeF	Seepage, slope.	Seepage	Not needed	Slope	Droughty, erodes easily, slope.
Reilly: Re	Seepage	Seepage	Not needed	Not needed	Not needed.
Rio Arriba: RoB, RoC2	Favorable	Compressible, hard to pack, shrink-swell.	Floods, percs slowly.	Percs slowly	Percs slowly.
Rio Piedras: RpD2, RpE2, RpF2	Slope	Compressible, hard to pack, low strength.	Not needed	Slope, rooting depth.	Slope.
Sabana: SaF	Slope, depth to rock.	Thin layer	Not needed	Depth to rock, slope, rooting depth.	Erodes easily, slope.
Sabana Seca: ScB	Favorable	Compressible, hard to pack, low strength.	Percs slowly, poor outlets, wetness.	Percs slowly, poor outlets, wetness.	Percs slowly, wetness.
Saladar: Sm	Excess humus	Excess humus, hard to pack, seepage.	Floods, poor outlets, wetness.	Percs slowly, poor outlets, wetness.	Percs slowly, rooting depth, wetness.
Soller: SoE, SoF	Slope, depth to rock.	Compressible, low strengtn, thin layer.	Not needed	Depth to rock, slope.	Slope, rooting depth.
Tanama: [1]TaF: Tanama part	Depth to rock, slope.	Compressible, low strength, thin layer.	Not needed	Depth to rock, slope.	Rooting depth, slope.
Rock outcrop part.					
Toa: To	Favorable	Favorable	Floods	Not needed	Favorable.
Torres: TrB	Favorable	Compressible, low strengtn.	Not needed	Too sandy, slope.	Droughty.
Tropopsamments: Ts	Seepage	Seepage, unstable fill.	Cutbanks cave, excess salt, floods.	Not needed	Not needed.
Urban land: [1]Ud: Urban land part.					
Durados part	Seepage	Seepage, piping, unstable fill.	Not needed	Too sandy, piping.	Droughty.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Urban land:					
[1]Um:					
Urban land part.					
Mucara part-----	Slope, depth to rock.	Shrink-swell, compressible, thin layer.	Not needed--------	Depth to rock, slope.	Slope, depth to rock.
[1]Us:					
Urban land part.					
Sabana Seca part	Favorable---------	Compressible, hard to pack, low strength.	Percs slowly, poor outlets, wetness.	Percs slowly, poor outlets, wetness.	Percs slowly, wetness.
[1]Uv:					
Urban land part.					
Vega Alta part--	Favorable---------	Compressible, hard to pack, low strength.	Not needed--------	Slope----------	Favorable.
Vega Alta:					
VaB, VaC2--------	Favorable---------	Compressible, hard to pack, low strength.	Not needed--------	Slope----------	Favorable.
Vega Baja:					
Vg----------	Slignt----------	Compressible, hard to pack, low strength.	Floods, percs slowly.	Complex slope, percs slowly.	Not needed.
Via:					
VkC2----------	Slope, seepage.	Compressible, low strength.	Not needed--------	Slope----------	Favorable.
Vivi:					
Vv----------	Seepage----------	Piping, low strength, hard to pack.	Not needed--------	Not needed--------	Not needed.
Yunes:					
YeE, YeF---------	Slope, seepage, depth to rock.	Thin layer--------	Not needed--------	Depth to rock, slope.	Slope, rooting depth.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Aceitunas:				
AaB	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
AaC	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.
Aibonito:				
AbD	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey.
AbE	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Almirante:				
AmB	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
AmC	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.
Bajura:				
Ba	Severe: floods, wetness, too clayey.	Severe: floods, too clayey, wetness.	Severe: floods, wetness, too clayey.	Severe: too clayey, wetness.
Bayamon:				
BmB	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Caguabo:				
CaE, CaF	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, too clayey.	Severe: slope.
[1]CoF:				
Caguabo part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, too clayey.	Severe: slope.
Rock outcrop part.				
Candelero:				
Ce	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.
Catalina:				
ClC	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
Catano:				
Cn	Moderate: too sandy.	Moderate: too sandy.	Severe: too sandy.	Moderate: too sandy.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cayagua: Co	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.
Colinas: CrD2	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
CrE2, CrF2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Coloso: Cs	Severe: floods, wetness.	Moderate: too clayey, wetness.	Moderate: too clayey, wetness.	Moderate: too clayey, wetness.
Consumo: CuE, CuF	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Corozal: CzC	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: slope, too clayey, wetness.	Severe: too clayey.
Daguey: DaC	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.
DaD	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey.
Descalabrado: DeF	Severe: slope.	Severe: slope.	Severe: slope; depth to rock.	Severe: slope.
[1]DgF: Descalabrado part.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop part.				
Dique: Dm	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Durados: Dr	Slight	Slight	Slight	Slight.
Estacion: Es	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods, too clayey.	Moderate: too clayey.
Guayama: GuF	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Humacao: Hm	Slight	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Humatas:				
HtE, HtF	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
[1]HuF:				
Humatas part	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Rock outcrop part.				
Hydraquents:				
Hy	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Jagueyes:				
JaE2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Juncal:				
JnD2	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.
Juncos:				
JuC	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.
JuD	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey.
Lares:				
LaB	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.
LaC2	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Limones:				
LmE, LmF	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Lirios:				
LoF2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Los Guineos:				
LsE, LsF	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Mabi:				
MaA, MaB	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
MaC	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.
Made land:				
Md.				

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Malaya:				
MlF	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Maricao:				
MoF	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Martin Pena:				
Mp	Severe: floods, percs slowly, wetness.	Severe: floods, wetness, excess humus.	Severe: floods, wetness, excess humus.	Severe: floods, wetness, excess humus.
Matanzas:				
MsB	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Montegrande:				
MtB	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
MtC	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.
Morado:				
MuF2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mucara:				
MxD	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey.
MxE, MxF	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Naranjito:				
NaD2	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
NaE2, NaF2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pandura:				
PaD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
PaE, PaF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pellejas:				
PeF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Reilly:				
Re	Moderate: floods, small stones.	Moderate: floods, small stones.	Severe: floods, small stones.	Moderate: small stones.
Rio Arriba:				
RoB, RoC2	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Rio Piedras: RpD2, RpE2, RpF2	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Sabana: SaF	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Sabana Seca: ScB	Severe: percs slowly, too clayey, wetness.	Severe: too clayey, wetness.	Severe: percs slowly, too clayey, wetness.	Severe: too clayey, wetness.
Saladar: Sm	Severe: excess humus, floods, percs slowly.	Severe: excess humus, floods, wetness.	Severe: excess humus, floods, wetness.	Severe: excess humus, floods, wetness.
Soller: SoE, SoF	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
Tanama: [1]TaF: Tanama part	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, depth to rock, too clayey.	Severe: slope, too clayey.
Rock outcrop part.				
Toa: To	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods, too clayey.	Moderate: too clayey.
Torres: TrB	Slight	Slight	Moderate: slope.	Slight.
Tropopsamments: Ts	Severe: floods, too sandy.	Severe: floods, too sandy.	Severe: floods, too sandy.	Severe: too sandy, floods.
Urban land: [1]Ud: Urban land part.				
Durados part	Slight	Slight	Slight	Slight.
[1]Um: Urban land part.				
Mucara part	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.
[1]Us: Urban land part.				
Sabana Seca part	Severe: percs slowly, too clayey, wetness.	Severe: too clayey, wetness.	Severe: percs slowly, too clayey, wetness.	Severe: too clayey, wetness.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Urban land:				
[1]Uv:				
Urban land part.				
Vega Alta part------	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Vega Alta:				
VaB------------------	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
VaC2-----------------	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
Vega Baja:				
Vg-------------------	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Via:				
VkC2-----------------	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
Vivi:				
Vv-------------------	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Yunes:				
YeE, YeF------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
Aceitunas:											
AaB, AaC----------	0-8	Clay----------	MH	A-7	0	100	100	90-100	75-95	50-70	15-25
	8-60	Clay----------	MH	A-7	0	100	100	90-100	75-95	50-70	15-25
Aibonito:											
AbD, AbE----------	0-7	Clay----------	MH	A-7	0	100	100	90-100	75-100	60-70	20-30
	7-43	Clay----------	MH	A-7	0	100	100	95-100	90-100	60-70	20-30
	43-99	Clay----------	MH	A-7	0	100	100	90-100	75-95	60-70	20-30
Almirante:											
AmB, AmC----------	0-60	Clay----------	MH	A-7	0	100	100	90-100	75-95	70-80	20-30
Bajura:											
Ba----------	0-60	Clay----------	CH	A-7	0	100	100	90-100	75-95	70-80	45-55
Bayamon:											
BmB----------	0-66	Clay----------	MH	A-7	0	100	100	90-100	75-95	50-60	10-20
Caguabo:											
CaE, CaF----------	0-4	Clay loam-------	CL, SC	A-7	0	75-100	55-100	50-100	40-80	40-50	20-30
	4-10	Very gravelly clay loam, very gravelly silty clay loam.	GC, SC	A-2	0	40-80	25-35	22-35	18-30	30-40	10-15
	10-16	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]CbF:											
Caguabo part-----	0-4	Clay loam-------	CL, SC	A-7	0	75-100	55-100	50-100	40-80	40-50	20-30
	4-10	Very gravelly clay loam, very gravelly silty clay loam.	GC, SC	A-2	0	40-80	25-35	22-35	18-30	30-40	10-15
	10-16	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Candelero:											
Ce----------	0-6	Loam----------	ML, SM	A-4, A-2	0	100	100	60-95	30-75	15-25	2-7
	6-35	Sandy clay loam	SC	A-6	0	100	100	80-90	35-50	30-40	15-25
	35-58	Sandy clay loam, sandy clay.	SC, CL	A-6	0	100	100	80-95	35-60	30-40	15-25
Catalina:											
ClC----------	0-6	Clay----------	MH	A-7	0	100	100	90-100	75-95	60-70	20-30
	6-84	Clay----------	MH	A-7	0	100	100	90-100	75-95	60-70	20-30
	84-99	Clay----------	MH	A-7	0	100	100	90-100	75-95	60-70	20-30
Catano:											
Cn----------	0-7	Loamy sand-------	SP-SM	A-2, A-3	0	100	100	50-70	5-15	<20	NP
	7-58	Sand----------	SP-SM	A-2, A-3	0	100	100	50-70	5-15	<20	NP
Cayagua:											
Co----------	0-8	Sandy loam------	SM, ML	A-2, A-4	0	100	100	60-90	30-60	30-40	2-7
	8-22	Clay, sandy clay	MH	A-7	0	100	100	85-100	50-95	60-70	20-30
	22-60	Sandy loam, sandy clay loam.	SM, ML	A-2, A-4	0	100	100	60-90	30-60	30-40	2-7
Colinas:											
CrD2, CrE2, CrF2--	0-26	Clay loam-------	CL	A-6	0	90-100	75-100	70-100	55-80	30-40	15-20
	26-52	Marl----------	CL, CL-ML	A-4	0	90-100	75-90	70-85	65-70	20-30	4-10

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Coloso:											
Cs	0-16	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-30
	16-70	Silty clay loam, silty clay, clay.	CL, MH, CH	A-7	0	100	100	95-100	85-95	40-70	20-35
Consumo:											
CuE, CuF	0-20	Clay	MH	A-7	0	100	100	90-100	85-95	70-80	25-35
	20-46	Clay, silty clay, silty clay loam.	MH	A-7	0	100	100	95-100	85-95	70-80	25-35
Corozal:											
CzC	0-9	Clay	MH	A-7	0	100	100	90-100	75-95	50-70	15-25
	9-40	Clay	MH	A-7	0	100	100	90-100	75-95	50-70	15-25
	40-60	Clay loam	CL	A-6	0	100	100	90-100	70-80	30-35	10-15
Daguey:											
DaC, DaD	0-10	Clay	MH	A-7	0	100	100	90-100	75-95	70-80	25-35
	10-72	Clay	MH	A-7	0	100	100	90-100	75-95	70-80	25-35
	72-90	Silty clay loam	MH	A-7	0	100	100	85-95	70-90	70-80	25-35
Descalabrado:											
DeF	0-5	Clay loam	CL	A-6	0	100	100	90-100	70-80	30-40	15-20
	5-17	Gravelly clay, gravelly clay loam, gravelly sandy clay loam.	SC, CL	A-6	0	100	50-75	45-75	38-70	30-40	12-20
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]DgF:											
Descalabrado part	0-5	Clay loam	CL	A-6	0	100	100	90-100	70-80	30-40	15-20
	5-17	Gravelly clay, gravelly clay loam, gravelly sandy clay loam.	SC, CL	A-6	0	100	50-75	45-75	38-70	30-40	12-20
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Dique:											
Dm	0-54	Loam	ML	A-4	0	100	100	85-100	60-90	30-40	5-10
Durados:											
Dr	0-14	Sandy loam	SM	A-2	0	100	100	60-70	25-35	---	NP
	14-23	Loamy sand	SM	A-2	0	100	100	50-75	15-30	---	NP
	23-60	Sand	SP-SM, SM	A-2, A-3	0	95-100	75-100	50-70	5-15	---	NP
Estacion:											
Es	0-8	Silty clay loam	CL	A-6	0	95-100	70-95	65-95	50-90	30-40	15-20
	8-20	Gravelly clay loam, gravelly silty clay loam.	GM-GC, GC, CL, CL-ML	A-4	0	65-80	55-75	50-75	40-70	20-30	5-10
	20-50	Gravelly sand	GP, GP-GM, SP, SP-SM	A-1	15-65	30-55	25-50	15-35	1-8	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Guayama:											
GuF	0-4	Clay loam	CL	A-6	0	100	75-100	70-100	55-80	30-40	15-20
	4-20	Gravelly clay, gravelly silty clay loam, clay.	GC, CL, SC	A-6, A-2	0	50-100	50-100	40-100	20-80	30-40	15-20
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Humacao:											
Hm	0-8	Loam	ML	A-4	0	100	100	85-95	60-75	30-40	5-10
	8-60	Sandy clay loam, clay loam.	CL	A-7	0	100	100	80-90	70-80	40-50	20-30
Humatas:											
HtE, HtF	0-5	Clay	MH	A-7	0	100	100	90-100	85-95	70-80	30-35
	5-24	Clay	MH	A-7	0	100	100	90-100	85-95	70-80	30-35
	24-60	Clay, silty clay, silty clay loam.	MH	A-7	0	100	100	95-100	85-95	60-70	25-30
[1]HuF:											
Humatas part	0-5	Clay	MH	A-7	0	100	100	90-100	85-95	70-80	30-35
	5-24	Clay	MH	A-7	0	100	100	90-100	85-95	70-80	30-35
	24-60	Clay, silty clay, silty clay loam.	MH	A-7	0	100	100	95-100	85-95	60-70	25-30
Rock outcrop part.											
Hydraquents:											
Hy	0-60	Variable	---	---	0	---	---	---	---	---	---
Jagueyes:											
JaL2	0-5	Loam	SM, ML	A-2, A-4	0	100	100	60-95	30-75	---	NP
	5-41	Clay loam, sandy clay loam.	CL, SC	A-6	0	100	100	80-100	35-80	35-40	15-20
	41-62	Sandy clay loam, clay loam.	SC, SM, ML, CL	A-4	0	100	100	80-100	35-80	25-35	5-10
Juncal:											
JnD2	0-10	Clay	MH	A-7	0	100	100	90-100	75-95	70-80	30-40
	10-48	Clay	MH	A-7	0	100	100	90-100	75-95	70-80	30-40
	48-60	Silty clay loam	MH	A-7	0	100	100	95-100	85-95	60-70	20-25
Juncos:											
JuC, JuD	0-31	Clay	CH	A-7	0	100	100	90-100	75-95	70-80	40-50
	31-40	Clay	CH	A-7	0	95-100	75-100	70-100	60-95	70-80	40-50
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lares:											
LaB, LaC2	0-36	Clay	MH	A-7	0	100	100	90-100	75-95	60-70	20-30
	36-60	Clay	MH	A-7	0	85-100	85-100	75-95	60-80	60-70	20-30
Limones:											
LmE, LmF	0-79	Clay	MH	A-7	0	100	100	90-100	75-95	70-80	30-40
Lirios:											
LoF2	0-4	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	15-25
	4-34	Clay, silty clay	MH	A-7	0	100	100	90-100	75-95	60-70	25-30
	34-60	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	15-25
Los Guineos:											
LsE, LsF	0-5	Clay	MH, CH	A-7	0	100	100	90-100	75-95	60-80	25-35
	5-60	Clay	MH, CH	A-7	0	100	100	90-100	75-95	60-80	25-35
Mabi:											
MaA, MaB, MaC	0-24	Clay	CH	A-7	0	100	90-100	85-100	70-95	55-75	40-60
	24-99	Clay	CH	A-7	0	100	90-100	85-100	70-95	55-75	40-60

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Made land:											
Md.											
Malaya:											
MlF----------	0-6	Clay loam-------	CL, ML	A-7	0	100	100	90-100	70-90	40-50	15-20
	6-13	Gravelly clay---	SC, CL, GC	A-7	0	60-80	55-75	50-75	40-70	40-50	20-30
	13-16	Gravelly clay loam.	SC, CL, SM, ML, GM, GC	A-2, A-7	0	60-80	55-75	50-75	30-60	40-50	15-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Maricao:											
MoF----------	0-14	Clay----------	MH	A-7	0	100	100	90-100	75-95	60-70	25-30
	14-60	Silty clay loam, silty clay.	MH	A-7	0	100	100	95-100	85-95	50-60	15-20
Martin Pena:											
Mp----------	0-8	Muck----------	OH	---	0	---	---	---	---	---	NP
	8-18	Silty clay loam, clay.	CH	A-7	0	100	100	95-100	85-95	50-60	30-40
	18-63	Clay----------	CH	A-7	0	100	100	90-100	75-95	70-80	40-50
Matanzas:											
MsB----------	0-20	Clay----------	MH	A-7	0	100	100	90-100	75-95	60-70	20-30
	20-53	Clay----------	MH	A-7	0	100	100	90-100	75-95	60-70	20-30
	53	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Montegrande:											
MtB, MtC----------	0-7	Clay----------	CH, MH	A-7	0	100	100	90-100	75-95	70-80	35-45
	7-29	Clay----------	CH, MH	A-7	0	100	100	90-100	75-95	70-80	35-45
	29-48	Very gravelly clay.	GC	A-2	0	40-50	20-35	18-20	15-19	30-40	15-20
Morado:											
MuF2----------	0-34	Clay loam-------	CL	A-7	0	100	100	90-100	70-80	40-50	20-30
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mucara:											
MxD, MxE, MxF-----	0-5	Clay----------	CH	A-7	0	100	100	90-100	75-95	70-80	40-50
	5-12	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	70-80	40-50
	12-30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Naranjito:											
NaD2, NaE2, NaF2--	0-4	Silty clay loam	MH	A-7	0	80-95	75-95	70-95	65-90	60-70	20-30
	4-24	Clay----------	MH	A-7	0	80-95	75-90	70-90	55-85	70-80	25-35
	24-40	Clay loam-------	CL	A-7	0	80-90	75-90	70-90	55-70	40-50	20-30
	40	Weatnered bedrock.	---	---	---	---	---	---	---	---	---
Pandura:											
PaD, PaE, PaF-----	0-7	Sandy loam------	SM, ML	A-2, A-4	0	100	100	60-95	30-75	<35	NP-10
	7-26	Sandy loam, loam	SM, ML	A-2, A-4	0	100	100	60-95	30-75	<35	NP-10
	26	Weatnered bedrock.	---	---	---	---	---	---	---	---	---
Pellejas:											
PeF----------	0-16	Clay loam-------	CL	A-7	0	100	100	85-100	60-80	40-50	20-30
	16-60	Sandy loam, loamy sand.	SM	A-2	0	100	100	50-75	25-35	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Reilly:											
Re	0-18	Sandy loam	SM	A-2-4	0	100	100	60-70	30-35	---	---
	18-55	Stratified very gravelly sand to sand.	SP-SM, GW	A-1	0	20-55	10-50	5-35	0-8	---	---
Rio Arriba:											
RoB, RoC2	0-8	Clay	CH	A-7	0	100	100	90-100	75-95	55-75	40-60
	8-60	Clay	CH	A-7	0	100	100	90-100	75-95	55-75	40-60
Rio Piedras:											
RpD2, RpE2, RpF2	0-8	Clay	MH	A-7	0	100	100	90-100	75-95	70-80	25-35
	8-28	Clay	MH	A-7	0	100	100	90-100	75-95	70-80	25-35
	28-48	Clay	MH	A-7	0	100	100	85-95	70-95	70-80	25-35
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sabana:											
SaF	0-3	Silty clay loam	CL	A-6	0	80-100	75-100	70-100	60-95	30-40	10-20
	3-15	Silty clay, clay	CH	A-7	0	80-100	75-100	65-100	55-95	70-80	40-50
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sabana Seca:											
ScB	0-70	Clay	MH	A-7	0	100	100	90-100	75-95	50-60	15-20
Saladar:											
Sm	0-51	Muck	OH	---	0	---	---	---	---	---	NP
Soller:											
SoE, SoF	0-5	Clay loam	CL	A-6	0-10	100	100	90-100	70-80	30-40	15-20
	5-12	Clay	CH	A-7	0-35	95-100	90-100	80-100	60-95	70-80	40-50
	12-24	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tanama:											
[1]TaF:											
Tanama part	0-14	Clay	MH	A-7	0-15	100	100	90-100	75-95	70-80	30-40
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Toa:											
To	0-60	Silty clay loam	CL	A-6	0	100	100	90-100	70-95	30-40	15-20
Torres:											
TrB	0-28	Loamy sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	50-70	5-40	---	NP
	28-64	Clay	MH	A-7	0	100	100	90-100	75-95	50-60	12-20
Tropopsamments:											
Ts	0-60	Sand	SP, SM, SM-SC	A-2, A-3, A-4	0	100	100	52-70	2-40	---	---
Urban land:											
[1]Ud:											
Urban land part.											
Durados part	0-14	Sandy loam	SM	A-2	0	100	100	60-70	25-35	---	NP
	14-23	Loamy sand	SM	A-2	0	100	100	50-75	15-30	---	NP
	23-60	Sand	SP-SM, SM	A-2, A-3	0	95-100	75-100	50-70	5-15	---	NP
[1]Um:											
Urban land part.											

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Urban land:											
Mucara part------	0-6	Clay----------	CH	A-7	0	100	100	90-100	75-95	70-80	40-50
	6-12	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	70-80	40-50
	12-22	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]Us:											
Urban land part.											
Sabana Seca part-	0-70	Clay----------	MH	A-7	0	100	100	90-100	75-95	50-60	15-20
[1]Uv:											
Urban land part.											
Vega Alta part---	0-8	Clay loam-------	MH	A-7	0	100	100	90-100	70-95	60-70	20-30
	8-84	Clay----------	MH	A-7	0	100	100	90-100	75-95	70-80	25-35
Vega Alta:											
VaB, VaC2---------	0-8	Clay loam-------	MH	A-7	0	100	100	90-100	70-95	60-70	20-30
	8-84	Clay----------	MH	A-7	0	100	100	90-100	75-95	70-80	25-35
Vega Baja:											
Vg----------	0-7	Silty clay------	CH	A-7	0	100	95-100	90-100	75-95	70-80	40-50
	7-50	Silty clay, clay, silty clay loam.	CH	---	0	100	95-100	90-100	75-95	70-80	40-50
	50-60	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	70-80	40-50
Via:											
VkC2----------	0-9	Clay loam-------	CL	A-7	0-5	100	85-95	80-95	60-90	40-50	20-30
	9-36	Clay loam, gravelly clay loam.	CL, GC, SC	A-6	0	65-95	50-90	45-90	35-70	30-40	15-20
	36-52	Very gravelly clay loam.	GP-GC, SP-SC, GC, SC	A-2, A-6	0	25-70	10-65	9-65	7-50	30-40	15-20
Vivi:											
Vv----------	0-9	Loam----------	ML, SM	A-2, A-4	0	100	100	60-95	30-75	---	---
	9-47	Very fine sandy loam, loam.	ML	A-4	0	100	100	85-95	50-75	---	---
	47-58	Loamy sand------	SP-SM, SM	A-1, A-2	0	100	85-100	45-65	5-15	---	---
Yunes:											
YeE, YeF----------	0-2	Silty clay loam	MH	A-7	0	100	75-100	70-100	60-95	60-70	20-30
	2-16	Very shaly silty clay loam.	GC, GP-GC	A-2	0	15-40	10-35	5-30	5-30	20-30	7-12
	16	Fragmental material.	---	---	---	---	---	---	---	---	---

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[Dashes indicate data were not available. The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Aceitunas:									
AaB, AaC	0-8	0.6-2.0	0.10-0.15	4.5-5.5	Low	High	High	0.10	5
	8-60	0.6-2.0	0.10-0.15	4.5-5.5	Low	High	High	0.10	
Aibonito:									
AbD, AbE	0-7	0.6-2.0	0.15-0.20	3.6-5.0	Moderate	High	High	0.10	4
	7-43	0.6-2.0	0.15-0.20	3.6-5.0	Moderate	High	High	0.10	
	43-99	0.6-2.0	0.15-0.20	3.6-5.0	Moderate	High	High	0.10	
Almirante:									
AmB, AmC	0-60	0.6-2.0	0.10-0.15	4.5-5.0	Moderate	High	High	0.17	4
Bajura:									
Ba	0-60	0.06-0.2	0.15-0.20	5.6-6.5	High	High	Moderate	---	---
Bayamon:									
BmB	0-66	0.6-2.0	0.10-0.15	4.5-5.0	Low	High	Moderate	0.10	5
Caguabo:									
CaE, CaF	0-4	0.6-2.0	0.10-0.15	6.1-6.5	Moderate	Moderate	Low	0.24	3
	4-10	0.6-2.0	0.05-0.07	6.1-6.5	Low	Low	Low	0.17	
	10-16	---	---	---	---	---	---	---	
	16	---	---	---	---	---	---	---	
[1]CbF:									
Caguabo part	0-4	0.6-2.0	0.10-0.15	6.1-6.5	Moderate	Moderate	Low	0.24	3
	4-10	0.6-2.0	0.05-0.07	6.1-6.5	Low	Low	Low	0.17	
	10-16	---	---	---	---	---	---	---	
	16	---	---	---	---	---	---	---	
Rock outcrop part.									
Candelero:									
Ce	0-6	2.0-6.0	0.05-0.10	4.5-6.0	Low	High	High	0.24	4
	6-35	0.06-0.2	0.10-0.15	4.5-6.0	Moderate	High	High	---	
	35-58	0.06-0.2	0.10-0.15	4.5-6.0	Moderate	High	Low	---	
Catalina:									
CtC	0-6	2.0-6.0	0.10-0.15	4.5-6.0	Moderate	High	Moderate	0.10	5
	6-84	2.0-6.0	0.10-0.15	4.5-6.0	Moderate	High	High	0.10	
	84-99	2.0-6.0	0.10-0.15	4.5-6.0	Moderate	High	Moderate	0.10	
Catano:									
Cn	0-7	>20.0	<0.05	7.9-8.4	Very low	Low	Low	---	---
	7-58	>20.0	<0.05	7.9-8.4	Very low	Low	Low	---	
Cayagua:									
Co	0-8	0.6-2.0	0.11-0.13	4.5-5.5	Very low	Low	High	0.24	4
	8-22	0.6-2.0	0.13-0.15	4.5-5.5	Moderate	High	High	0.20	
	22-60	2.0-6.0	0.11-0.13	4.5-7.3	Very low	Low	High	0.24	
Colinas:									
CrD2, CrE2, CrF2	0-26	0.6-2.0	0.18-0.20	7.4-7.8	Moderate	Moderate	Low	0.17	3
	26-52	2.0-6.0	0.05-0.10	7.4-7.8	Low	Low	Low	0.10	
Coloso:									
Cs	0-16	0.2-0.6	0.14-0.18	5.6-6.0	Moderate	High	Low	---	---
	16-70	0.06-0.2	0.12-0.18	5.6-6.0	High	High	Low	---	
Consumo:									
CuE, CuF	0-20	0.6-2.0	0.12-0.18	4.5-5.0	Moderate	High	High	0.17	3
	20-46	0.6-2.0	0.10-0.16	4.5-5.0	Moderate	High	High	---	

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Corozal:									
CzC	0-9	0.06-0.2	0.15-0.20	4.5-5.0	Moderate	High	High	0.24	5
	9-40	0.06-0.2	0.15-0.20	4.5-5.0	Moderate	High	High	---	
	40-60	0.6-2.0	0.10-0.15	4.5-5.0	Moderate	High	High	---	
Daguey:									
DaC, DaD	0-10	0.6-2.0	0.15-0.20	4.5-5.0	Moderate	High	High	0.10	4
	10-72	0.6-2.0	0.15-0.20	4.5-5.0	Moderate	High	High	0.10	
	72-90	0.6-2.0	0.10-0.15	4.5-5.0	Moderate	High	High	0.10	
Descalabrado:									
DeF	0-5	0.6-2.0	0.15-0.20	6.6-7.3	Low	Moderate	Low	0.24	3
	5-17	0.6-2.0	0.10-0.15	6.6-7.3	Low	Moderate	Low	---	
	17	---	---	---	---	---	---	---	
[1]DgF:									
Descalabrado part	0-5	0.6-2.0	0.15-0.20	6.6-7.3	Low	Moderate	Low	0.24	3
	5-17	0.6-2.0	0.10-0.15	6.6-7.3	Low	Moderate	Low	---	
	17	---	---	---	---	---	---	---	
Rock outcrop part.									
Dique:									
Dm	0-54	2.0-6.0	0.10-0.15	5.6-6.0	Low	Low	Moderate	---	---
Durados:									
Dr	0-14	6.0-20	0.05-0.10	6.6-7.3	Low	Low	Low	---	---
	14-23	6.0-20	0.05-0.10	7.9-8.4	Low	Low	Low	---	
	23-60	>20	<0.05	7.9-8.4	Low	Low	Low	---	
Estacion:									
Es	0-8	0.6-2.0	0.12-0.15	5.6-6.5	Moderate	Moderate	Moderate	---	---
	8-20	2.0-6.0	0.12-0.15	5.6-6.5	Low	Moderate	Moderate	---	
	20-50	>6.0	0.02-0.05	5.6-6.5	Low	Low	Moderate	---	
Guayama:									
GuF	0-4	0.6-2.0	0.10-0.15	6.6-7.8	Moderate	Moderate	Low	0.24	3
	4-20	0.6-2.0	0.10-0.15	6.6-7.8	Moderate	Moderate	Low	0.20	
	20	---	---	---	---	---	---	---	
Humacao:									
Hm	0-8	2.0-6.0	0.05-0.10	5.1-6.0	Low	Low	Moderate	0.17	5
	8-60	0.6-2.0	0.10-0.15	5.1-6.0	Moderate	Moderate	Moderate	---	
Humatas:									
HtE, HtF	0-5	0.6-2.0	0.12-0.18	4.5-5.5	Moderate	High	High	0.10	4
	5-24	0.6-2.0	0.12-0.18	4.5-5.5	Moderate	High	High	---	
	24-60	0.6-2.0	0.10-0.16	4.5-5.5	Moderate	High	High	---	
[1]HuF:									
Humatas part	0-5	0.6-2.0	0.12-0.18	4.5-5.5	Moderate	High	High	0.10	4
	5-24	0.6-2.0	0.12-0.18	4.5-5.5	Moderate	High	High	---	
	24-60	0.6-2.0	0.10-0.16	4.5-5.5	Moderate	High	High	---	
Rock outcrop part.									
Hydraquents:									
Hy	0-60	---	---	7.9-9.0	---	High	High	---	---
Jagueyes:									
JaE2	0-5	2.0-6.0	0.02-0.05	4.5-5.0	Low	Low	High	0.02	4
	5-41	0.6-2.0	0.05-0.10	4.5-5.0	Low	Low	High	---	
	41-62	0.6-2.0	0.05-0.10	4.5-5.0	Low	Low	High	---	
Juncal:									
JnD2	0-10	0.6-2.0	0.15-0.20	5.6-6.5	Moderate	High	Moderate	0.17	3
	10-48	0.6-2.0	0.15-0.20	6.6-7.8	Moderate	High	Low	---	
	48-60	0.6-2.0	0.15-0.20	7.4-7.8	Moderate	Moderate	Low	---	

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Juncos:									
JuC, JuD	0-31	0.06-0.2	0.15-0.17	6.1-7.3	High	High	Low	0.17	3
	31-40	0.06-0.2	0.13-0.16	6.1-7.3	High	High	Low	0.17	
	40	---	---	6.1-7.3	---	---	---	---	
Lares:									
LaB, LaC2	0-36	0.6-2.0	0.07-0.13	4.5-5.0	Moderate	High	High	0.10	5
	36-60	0.2-0.6	0.07-0.13	4.5-5.0	Moderate	High	High	---	
Limones:									
LmE, LmF	0-79	0.6-2.0	0.15-0.20	3.6-5.0	Moderate	High	High	0.02	4
Lirios:									
LoF2	0-4	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	Moderate	High	0.17	4
	4-34	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	High	High	---	
	34-60	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	Moderate	High	---	
Los Guineos:									
LsE, LsF	0-5	0.6-2.0	0.15-0.17	4.5-5.5	Moderate	High	High	0.10	4
	5-60	0.6-2.0	0.15-0.17	4.5-5.5	Moderate	High	High	0.01	
Mabi:									
MaA, MaB, MaC	0-24	0.06-0.2	0.15-0.20	4.5-6.0	High	High	Moderate	0.32	4
	24-99	0.06-0.2	0.15-0.20	7.4-7.8	High	High	Low	---	
Made land:									
Md.									
Malaya:									
MlF	0-6	0.6-2.0	0.15-0.20	5.6-6.5	Moderate	High	Low	0.24	3
	6-13	0.6-2.0	0.10-0.20	6.6-8.4	Moderate	Moderate	Low	---	
	13-18	0.6-2.0	0.10-0.20	6.6-8.4	Moderate	Moderate	Low	---	
	18	---	---	---	---	---	---	---	
Maricao:									
MoF	0-14	0.6-2.0	0.15-0.20	4.5-5.0	Moderate	High	High	0.17	3
	14-60	0.6-2.0	0.10-0.15	4.5-5.0	Moderate	Moderate	High	---	
Martin Pena:									
Mp	0-8	0.6-2.0	0.15-0.20	6.6-7.8	Low	Moderate	Low	---	---
	8-18	0.6-2.0	0.12-0.15	6.6-7.8	Moderate	High	Low	---	
	18-63	<0.06	0.15-0.20	6.6-7.8	High	High	Low	---	
Matanzas:									
MsB	0-20	0.6-2.0	0.15-0.20	5.6-7.3	Moderate	High	Low	0.10	4
	20-53	0.6-2.0	0.15-0.20	5.6-7.3	Moderate	High	Low	0.10	
	53	---	---	---	---	---	---	---	
Montegrande:									
MtB, MtC	0-7	0.2-0.6	0.15-0.17	5.1-6.5	High	High	Moderate	0.17	4
	7-29	0.2-0.6	0.15-0.17	6.1-7.3	High	High	Moderate	---	
	29-48	0.6-2.0	0.10-0.15	6.6-7.3	Moderate	Moderate	Low	---	
Morado:									
MuF2	0-34	0.6-2.0	0.10-0.15	6.1-7.3	Moderate	Moderate	Low	0.17	3
	34	---	---	---	---	---	---	---	
Mucara:									
MxD, MxE, MxF	0-5	0.6-2.0	0.15-0.17	6.1-6.5	High	High	Low	0.17	3
	5-12	0.6-2.0	0.15-0.17	6.1-6.5	High	High	Low	---	
	12-30	---	---	6.6-7.3	---	---	---	---	
	30	---	---	---	---	---	---	---	
Naranjito:									
NaD2, NaE2, NaF2	0-4	0.6-2.0	0.16-0.20	4.5-5.5	Moderate	High	High	0.17	3
	4-12	0.6-2.0	0.15-0.17	4.5-5.5	High	High	High	0.17	
	12-40	0.6-2.0	0.15-0.19	4.5-5.5	Moderate	High	High	0.17	
	40	---	---	---	---	---	---	---	

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Pandura:									
PaD, PaE, PaF-----	0-7	2.0-6.0	0.02-0.10	5.1-6.0	Very low	Low----------	Moderate-------	0.24	3
	7-26	2.0-6.0	0.02-0.10	5.1-6.0	Low-------	Low----------	Moderate-------	---	
	26	2.0-20	0.02-0.05	5.1-6.0	Very low	Low----------	Moderate-------	---	
Pellejas:									
PeF----------	0-16	0.6-2.0	0.16-0.21	4.5-5.5	Moderate	Low----------	High----------	0.24	3
	16-60	6.0-20	0.06-0.13	4.5-5.5	Low-------	Low----------	High----------	0.32	
Reilly:									
Re----------	0-18	2.0-6.0	0.05-0.10	5.6-6.5	Very low	Low----------	Moderate-------	---	---
	18-55	>20	<0.05	5.6-6.5	Very low	Low----------	Moderate-------	---	
Rio Arriba:									
RoB, RoC2---------	0-8	0.2-0.6	0.15-0.20	5.6-7.8	High------	High----------	Low----------	0.17	4
	8-60	0.2-0.6	0.15-0.20	5.6-7.8	High------	High----------	Low----------	---	
Rio Piedras:									
RpD2, RpE2, RpF2--	0-8	0.2-0.6	0.15-0.20	4.5-5.5	Moderate	High----------	High----------	0.17	4
	8-28	0.2-0.6	0.15-0.20	4.5-5.5	Moderate	High----------	High----------	0.17	
	28-48	0.2-0.6	0.15-0.20	4.5-5.5	Moderate	High----------	High----------	0.17	
	48	---	---	---	----------	----------	----------	---	
Sabana:									
SaF----------	0-3	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	Moderate------	High----------	0.24	3
	3-15	0.6-2.0	0.20-0.24	4.5-5.5	High------	High----------	High----------	---	
	15	---	---	---	----------	----------	----------	---	
Sabana Seca:									
ScB----------	0-70	<0.06	0.15-0.20	3.6-5.0	Moderate	High----------	High----------	0.24	4
Saladar:									
Sm----------	0-51	0.06-0.2	0.15-0.20	6.6-7.8	Low-------	Moderate------	Low----------	---	---
Soller:									
SoE, SoF----------	0-5	0.6-2.0	0.10-0.15	6.6-8.4	Moderate	High----------	Low----------	0.17	3
	5-12	0.6-2.0	0.18-0.20	6.6-8.4	High------	High----------	Low----------	0.17	
	12-24	---	---	---	----------	----------	----------	---	
	24	---	---	---	----------	----------	----------	---	
Tanama:									
[1]TaF:									
Tanama part------	0-14	0.6-2.0	0.15-0.20	6.1-7.8	Moderate	High----------	Low----------	0.24	1
	14	---	---	---	----------	----------	----------	---	
Rock outcrop part.									
Toa:									
To----------	0-60	0.6-2.0	0.15-0.20	6.1-7.3	Moderate	Moderate------	Low----------	---	---
Torres:									
TrB----------	0-28	6.0-20	0.02-0.05	4.5-5.5	Low-------	Low----------	High----------	---	---
	28-64	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	High----------	High----------	---	
Tropopsamments:									
Ts----------	0-60	>20.0	<0.05	7.9-8.4	Low-------	High----------	High----------	---	---
Urban land:									
[1]Ud:									
Urban land part.									
Durados part-----	0-14	6.0-20	0.05-0.10	6.6-7.3	Low-------	Low----------	Low----------	---	---
	14-23	6.0-20	0.05-0.10	7.9-8.4	Low-------	Low----------	Low----------	---	
	23-60	>20	<0.05	7.9-8.4	Low-------	Low----------	Low----------	---	
[1]Um:									
Urban land part.									

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Urban land:									
Mucara part------	0-6	0.6-2.0	0.15-0.17	5.6-7.3	High------	High----------	Low----------	0.17	3
	6-12	0.6-2.0	0.15-0.17	5.6-7.3	High------	High----------	Low----------	---	
	12-22	---	---	---	----------	----------	----------	---	
	22	---	---	---	----------	----------	----------	---	
[1]Us:									
Urban land part.									
Sabana Seca part-	0-70	<0.06	0.15-0.20	3.6-5.0	Moderate	High----------	High----------	0.24	4
[1]Uv:									
Urban land part.									
Vega Alta part---	0-8	0.6-2.0	0.15-0.20	4.5-5.5	Low-------	Moderate------	Moderate-------	0.17	4
	8-84	0.6-2.0	0.15-0.20	4.5-5.5	Low-------	High----------	Moderate-------	---	
Vega Alta:									
VaB, VaC2---------	0-8	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	Moderate------	Moderate-------	0.17	4
	8-84	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	High----------	Moderate-------	---	
Vega Baja:									
Vg----------	0-7	0.06-0.2	0.15-0.20	4.5-6.0	High------	High----------	High----------	0.24	4
	7-50	0.06-0.2	0.15-0.20	4.5-6.0	High------	High----------	High----------	0.24	
	50-60	0.06-0.2	0.15-0.20	4.5-6.0	High------	High----------	High----------	0.24	
Via:									
VkC2----------	0-9	0.6-2.0	0.17-0.20	3.6-4.4	Moderate	Moderate------	Moderate-------	0.17	5
	9-36	0.6-2.0	0.12-0.20	6.1-6.5	Moderate	Moderate------	Low----------	0.17	
	36-52	2.0-6.0	0.03-0.07	5.6-6.0	Low-------	Low----------	Low----------	0.20	
Vivi:									
Vv----------	0-9	2.0-6.0	0.11-0.18	4.5-5.5	Very low	Moderate------	High----------	---	---
	9-47	2.0-6.0	0.15-0.18	4.5-5.5	Very low	Moderate------	High----------	---	
	47-58	6.0-20.0	0.04-0.08	4.5-5.5	Very low	Moderate------	High----------	---	
Yunes:									
YeE, YeF----------	0-2	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	Moderate------	High----------	0.17	3
	2-16	2.0-6.0	0.10-0.15	4.5-5.5	Low-------	Moderate------	High----------	0.17	
	16	---	---	---	----------	----------	----------	---	

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 15.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol < means less than; > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Subsidence	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total
					Ft			In		In	In
Aceitunas: AaB, AaC	B	None	---	---	>6.0	---	---	>60	---	---	---
Aibonito: AbD, AbE	C	None	---	---	>6.0	---	---	>60	---	---	---
Almirante: AmB, AmC	B	None	---	---	>6.0	---	---	>60	---	---	---
Bajura: Ba	D	Frequent	Brief	Jul-Sep	0.5-2.5	Apparent	Jul-Sep	>60	---	---	---
Bayamon: BmB	B	None	---	---	>6.0	---	---	>60	---	---	---
Caguabo: CaE, CaF	D	None	---	---	>6.0	---	---	10-20	Hard	---	---
[1]CbF: Caguabo part	D	None	---	---	>6.0	---	---	10-20	Hard	---	---
Rock outcrop part.											
Candelero: Ce	C	Rare	---	---	1.0-1.5	Perched	Aug-Sep	>60	---	---	---
Catalina: ClC	B	None	---	---	>6.0	---	---	>60	---	---	---
Catano: Cn	A	None	---	---	>6.0	---	---	>60	---	---	---
Cayagua: Co	C	None	---	---	0.5-1.5	Perched	Aug-Oct	>60	---	---	---
Colinas: CrD2, CrE2, CrF2	B	None	---	---	>6.0	---	---	>60	---	---	---
Coloso: Cs	D	Frequent	Brief	Jul-Sep	2.0-4.0	Apparent	Jul-Sep	>60	---	---	---
Consumo: CuE, CuF	B	None	---	---	>6.0	---	---	>60	---	---	---
Corozal: CzC	C	None	---	---	0-1.0	Perched	Jul-Oct	>60	---	---	---
Daguey: DaC, DaD	C	None	---	---	>6.0	---	---	>60	---	---	---
Descalabrado: DeF	D	None	---	---	>6.0	---	---	10-20	Hard	---	---
[1]DgF: Descalabrado part	D	None	---	---	>6.0	---	---	10-20	Hard	---	---
Rock outcrop part.											
Dique: Dm	B	Common	Very brief	Jun-Oct	>6.0	---	---	>60	---	---	---

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Subsidence	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total
					Ft			In		In	In
Durados: Dr	A	Rare	Very brief	Jul-Oct	>6.0	---	---	>60	---	---	---
Estacion: Es	B	Common	Very brief	Jun-Oct	>6.0	---	---	>60	---	---	---
Guayama: GuF	D	None	---	---	>6.0	---	---	10-20	Hard	---	---
Humacao: Hm	B	None	---	---	>6.0	---	---	>60	---	---	---
Humatas: HtE, HtF	C	None	---	---	>6.0	---	---	>60	---	---	---
[1]HuF: Humatas part	C	None	---	---	>6.0	---	---	>60	---	---	---
Rock outcrop part.											
Hydraquents: Hy	D	Frequent	Very long	Jul-Jun	0-1.0	Apparent	Jul-Jun	>60	---	---	---
Jagueyes: JaE2	B	None	---	---	>6.0	---	---	>60	---	---	---
Juncal: JnD2	C	None	---	---	>6.0	---	---	>60	---	---	---
Juncos: JuC, JuD	D	None	---	---	>6.0	---	---	>36	Rippable	---	---
Lares: LaB, LaC2	C	None	---	---	>6.0	---	---	>60	---	---	---
Limones: LmE, LmF	B	None	---	---	>6.0	---	---	>60	---	---	---
Lirios: LoF2	B	None	---	---	>6.0	---	---	>60	---	---	---
Los Guineos: LsE, LsF	C	None	---	---	>6.0	---	---	>60	---	---	---
Mabi: MaA, MaB, MaC	D	Rare	Brief	Jun-Oct	1.5-3.0	Perched	Jun-Oct	>60	---	---	---
Made land: Md.											
Malaya: MlF	D	None	---	---	>6.0	---	---	12-20	Hard	---	---
Maricao: MoF	B	None	---	---	>6.0	---	---	>60	---	---	---
Martin Pena: Mp	D	Frequent	Very long	Jun-Oct	0.5-1.0	Apparent	Jun-Oct	>60	---	---	---
Matanzas: MsB	B	None	---	---	>6.0	---	---	30-58	Hard	---	---
Montegrande: MtB, MtC	D	Rare	---	---	>6.0	---	---	>60	---	---	---

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Subsidence	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total
					Ft			In		In	In
Morado: MuF2	C	None	---	---	>6.0	---	---	22-42	Ripable	---	---
Mucara: MxD, MxE, MxF	D	None	---	---	>6.0	---	---	20-36	Ripable	---	---
Naranjito: NaD2, NaE2, NaF2	C	None	---	---	>6.0	---	---	29-45	Ripable	---	---
Pandura: PaD, PaE, PaF	D	None	---	---	>6.0	---	---	12-19	Ripable	---	---
Pellejas: PeF	B	None	---	---	>6.0	---	---	>60	---	---	---
Reilly: Re	A	Occasional	Very brief	Aug-Oct	2.5-5.0	Apparent	Aug-Oct	>60	---	---	---
Rio Arriba: RoB, RoC2	D	Rare	Brief	Jun-Oct	>6.0	---	---	>60	---	---	---
Rio Piedras: RpD2, RpE2, RpF2	B	None	---	---	>6.0	---	---	>60	---	---	---
Sabana: SaF	D	None	---	---	>6.0	---	---	10-20	Hard	---	---
Sabana Seca: ScB	D	None	---	---	2.0-3.0	Apparent	Jul-Oct	>60	---	---	---
Saladar: Sm	D	Frequent	Very long	Jun-Oct	0-0.5	Apparent	Jun-May	>60	---	---	18
Soller: SoE, SoF	D	None	---	---	>6.0	---	---	20-34	Hard	---	---
Tanama: [1]TaF:											
Tanama part	D	None	---	---	>6.0	---	---	12-20	Hard	---	---
Rock outcrop part.											
Toa: To	B	Occasional	Brief	Jul-Oct	>6.0	---	---	>60	---	---	---
Torres: TrB	A	None	---	---	>6.0	---	---	>60	---	---	---
Tropopsamments: Ts	A	Frequent	Very brief	Jul-Jun	0-3.0	Apparent	Jul-Jun	>60	---	---	---
Urban land: [1]Ud:											
Urban land part.											
Durados part	A	Rare	Very brief	Jul-Oct	>6.0	---	---	>60	---	---	---
[1]Um:											
Urban land part.											
Mucara part	D	None	---	---	>6.0	---	---	20-36	Ripable	---	---

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding		High water table				Bedrock		Subsidence	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total
					Ft			In		In	In
Urban land:											
[1]Us:											
Urban land part.											
Sabana Seca part	D	None	---	---	2.0-3.0	Apparent	Jul-Oct	>60	---	---	---
[1]Uv:											
Urban land part.											
Vega Alta part--	C	None	---	---	>6.0	---	---	>60	---	---	---
Vega Alta:											
VaB, VaC2	C	None	---	---	>6.0	---	---	>60	---	---	---
Vega Baja:											
Vg	C	Occasional	Brief	Jul-Sep	1.5-3.0	Apparent	Jul-Sep	>60	---	---	---
Via:											
VkC2	B	None	---	---	>6.0	---	---	>60	---	---	---
Vivi:											
Vv	B	Occasional	Very brief	Jul-Oct	>6.0	---	---	>60	---	---	---
Yunes:											
YeE, YeF	D	None	---	---	>6.0	---	---	10-20	Rippable	---	---

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 16.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aceitunas	Clayey, oxidic, isohyperthermic Typic Palehumults
Aibonito	Clayey, oxidic, isohyperthermic Orthoxic Tropohumults
Almirante	Clayey, oxidic, isohyperthermic Plinthic Paleudults
Bajura	Fine, mixed, nonacid, isohyperthermic Vertic Tropaquepts
Bayamon	Clayey, oxidic, isohyperthermic Typic Haplorthox
Caguabo	Loamy-skeletal, mixed, isohyperthermic Lithic Eutropepts
Candelero	Fine-loamy, mixed, isohyperthermic Aeric Tropaqualfs
Catalina	Clayey, oxidic, isohyperthermic Tropeptic Haplorthox
Catano	Carbonatic, isonyperthermic Typic Tropopsamments
Cayagua	Fine, mixed, isonyperthermic Aeric Tropaqualfs
Colinas	Fine-loamy, carbonatic, isohypertnermic Eutropeptic Rendolls
Coloso	Fine, mixed, nonacid, isohyperthermic Aeric Tropic Fluvaquents
Consumo	Clayey, mixed, isohyperthermic Dystropeptic Tropudults
Corozal	Clayey, mixed, isohyperthermic Aquic Tropudults
Daguey	Clayey, oxidic, isohyperthermic Orthoxic Troponumults
Descalabrado	Clayey, mixed, isohyperthermic Lithic Vertic Ustropepts
Dique	Fine-loamy, mixed, isohyperthermic Fluventic Eutropepts
Durados	Sandy, mixed, isohyperthermic Fluventic Hapludolls
Estacion	Fine-loamy over sandy or sandy-skeletal, mixed, isohypertnermic Fluventic Hapludolls
Guayama	Clayey, mixed, isohyperthermic Lithic Haplustalfs
Humacao	Fine-loamy, mixed, isohyperthermic Fluventic Eutropepts
Humatas	Clayey, kaolinitic, isohyperthermic Typic Tropohumults
Hydraquents	Hydraquents
Jagueyes	Fine-loamy, mixed, isohyperthermic Orthoxic Tropudults
Juncal	Fine, mixed, isohyperthermic Typic Tropudalfs
Juncos	Fine, montmorillonitic, isohyperthermic Vertic Eutropepts
Lares	Clayey, mixed, isohyperthermic Aquic Tropohumults
Limones	Clayey, kaolinitic, isohyperthermic Epiaquic Orthoxic Tropohumults
Lirios	Clayey over loamy, mixed, isohyperthermic Typic Tropudults
Los Guineos	Clayey, mixed, isothermic Epiaquic Tropohumults
Mabi	Fine, montmorillonitic, isohyperthermic Vertic Eutropepts
Malaya	Clayey, mixed, isohyperthermic Lithic Eutropepts
Maricao	Clayey, mixed, isothermic Dystropeptic Tropudults
Martin Pena	Fine, mixed, nonacid, isohyperthermic Tropic Fluvaquents
Matanzas	Clayey, oxidic, isohyperthermic Tropeptic Eutrorthox
Montegrande	Fine, mixed, isohyperthermic Vertic Eutropepts
Morado	Fine-loamy, mixed, isohyperthermic Typic Eutropepts
Mucara	Clayey, montmorillonitic, isonyperthermic, shallow Vertic Eutropepts
Naranjito	Clayey, mixed, isohyperthermic Typic Troponumults
Pandura	Loamy, mixed, isohyperthermic, shallow Typic Eutropepts
Pellejas	Fine-loamy over sandy or sandy-skeletal, mixed, isohyperthermic Typic Dystropepts
Reilly	Sandy-skeletal, mixed, isohyperthermic Fluventic Hapludolls
Rio Arriba	Fine, mixed, isohyperthermic Vertic Paleudalfs
Rio Piedras	Clayey, kaolinitic, isonyperthermic Typic Tropudults
Sabana	Clayey, mixed, isohyperthermic Lithic Dystropepts
Sabana Seca	Clayey, mixed, isohyperthermic Oxic Plinthaquults
Saladar	Euic, isonyperthermic Fluvaquentic Troposaprists
Soller	Clayey, mixed, isohyperthermic, shallow Eutropeptic Rendolls
Tanama	Clayey, mixed, isohyperthermic Lithic Tropudalfs
Toa	Fine, mixed, isohyperthermic Fluventic Hapludolls
Torres	Clayey, oxidic, isohypertnermic Plinthic Palehumults
Tropopsamments	Tropopsamments
Vega Alta	Clayey, mixed, isohypertnermic Plinthic Tropudults
Vega Baja	Fine, mixed, isohypertnermic Aeric Tropaqualfs
Via	Fine-loamy, mixed, isohyperthermic Typic Tropudalfs
Vivi	Coarse-loamy, mixed, isohyperthermic Fluventic Eutropepts
Yunes	Loamy-skeletal, mixed, isonyperthermic, shallow Typic Dystropepts

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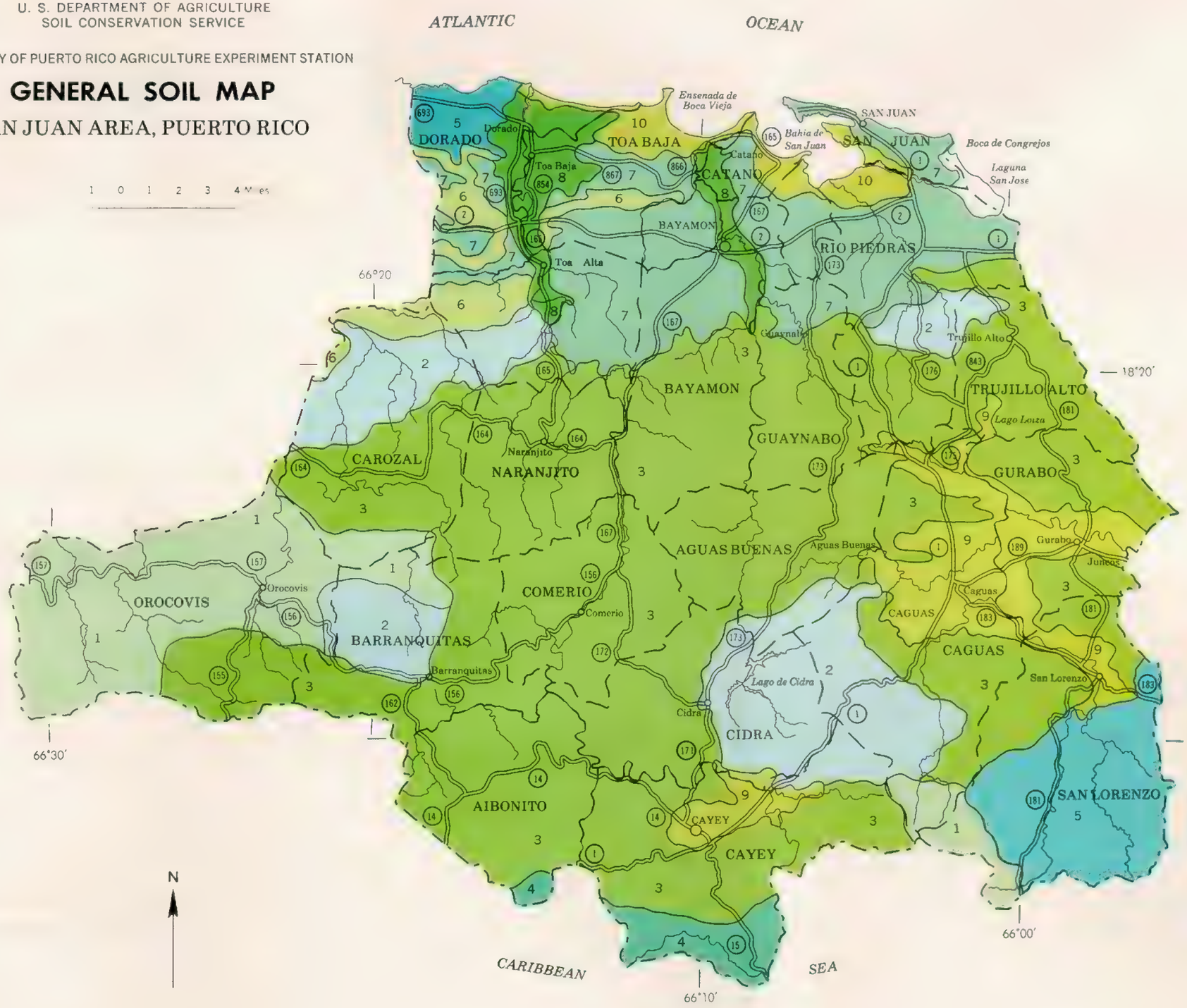
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

UNIVERSITY OF PUERTO RICO AGRICULTURE EXPERIMENT STATION

GENERAL SOIL MAP

SAN JUAN AREA, PUERTO RICO

1 0 1 2 3 4 Miles



SOIL ASSOCIATIONS

SOILS FORMED IN RESIDIUM FROM BASIC VOLCANIC ROCKS

1 — Maricao-Los Guineos: Deep, steep to very steep, well drained and moderately well drained soils of the humid mountainous areas

2 — Humatas-Naranjito-Consumo: Deep to moderately deep, moderately steep to very steep, well drained soils of the humid mountainous areas

3 — Mucara-Caguabo: Moderately deep to shallow, moderately steep to very steep well drained soils of the humid mountainous areas

4 — Descalabrado: Shallow, very steep, well drained soils of the semi-arid mountainous areas

SOILS FORMED IN RESIDIUM FROM INTRUSIVE IGNEOUS ROCK

5 — Pandura-Lirios: Shallow to deep, moderately steep to very steep, well drained soils of the humid mountainous areas

SOILS FORMED IN RESIDIUM FROM LIMESTONE

6 — Tanama-Colinas-Soller: Shallow to moderately deep, moderately steep to very steep, well drained soils of the humid mountainous areas

SOILS FORMED IN TRANSPORTED MATERIALS

7 — Almirante-Vega Alta-Matanzas: Deep, gently sloping to sloping, well drained soils on terraces and alluvial fans of the coastal plain

8 — Toa-Bajura-Coloso: Deep, nearly level, well drained to poorly drained soils on flood plains

9 — Mabi-Rio Arriba: Deep, nearly level to sloping, moderately well drained to somewhat poorly drained soils on terraces, foot slopes, and alluvial fans of inner valleys

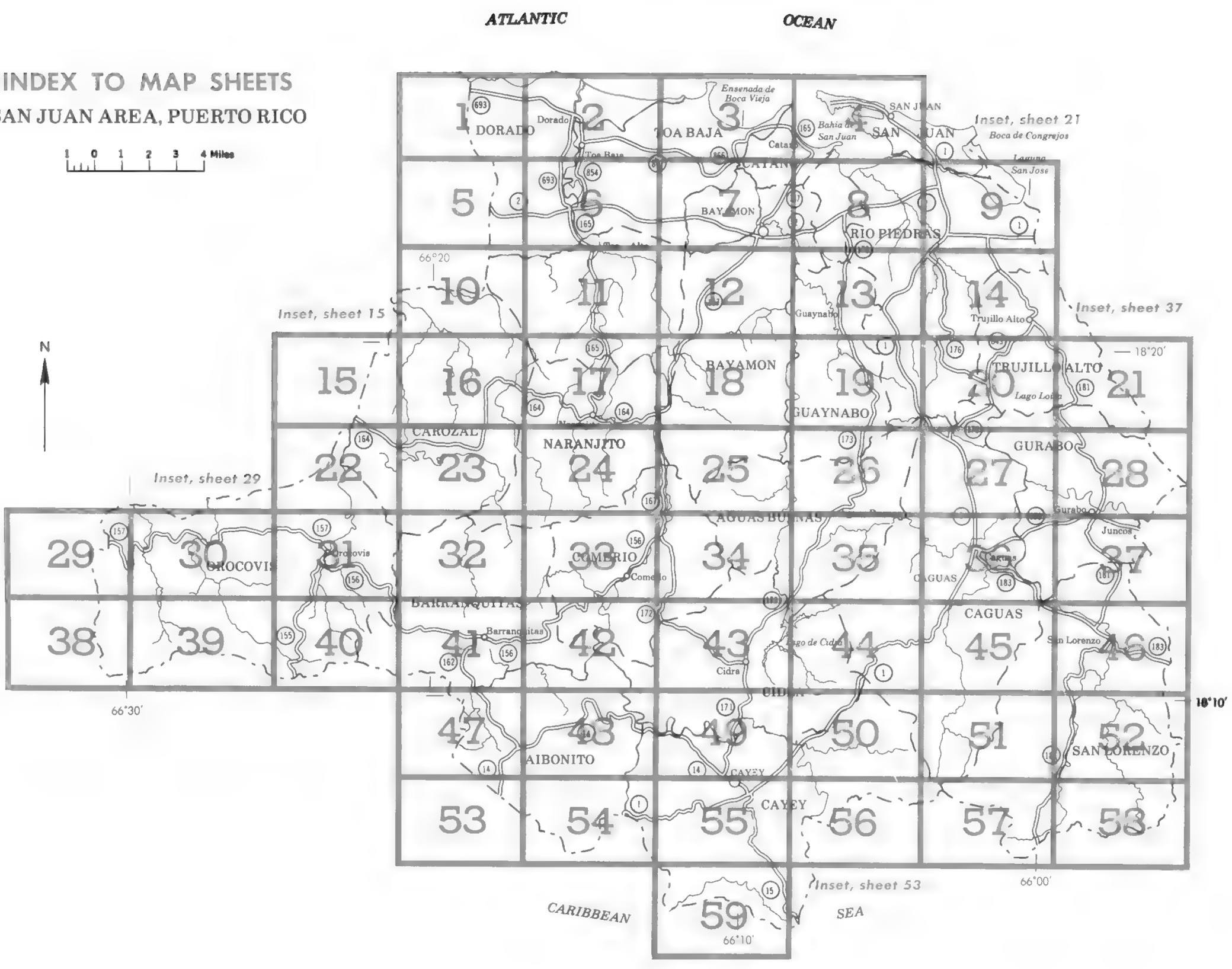
10 — Martin Pena-Saladar-Hydraquents: Deep, nearly level, very poorly drained soils in low depressions and lagoons of the coastal plain

Compiled 1978

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS

SAN JUAN AREA, PUERTO RICO



SOIL LEGEND

The first capital letter is the initial one of the soil name. The second capital letter, A, B, C, D, E, or F shows the slope. Symbols without a slope letter are for nearly level soils, or land types. A final number, 2, in the symbol, shows the soil is eroded.

SYMBOL	NAME
AaB	Aceitunas clay, 2 to 5 percent slopes
AaC	Aceitunas clay, 5 to 12 percent slopes
AbD	Albonito clay, 12 to 20 percent slopes
AbE	Albonito clay, 20 to 40 percent slopes
AmB	Almirante clay, 2 to 5 percent slopes
AmC	Almirante clay, 5 to 12 percent slopes
Ba	Bajura clay
BmB	Bayamon clay, 2 to 5 percent slopes
CaE	Caguabo clay loam, 20 to 40 percent slopes
CaF	Caguabo clay loam, 40 to 60 percent slopes
CbF	Caguabo-Rock outcrop complex, 40 to 60 percent slopes
Ce	Candelero loam
C1C	Catalina clay, 4 to 12 percent slopes
Cn	Catano loamy sand
Co	Cayagua sandy loam
CrD2	Colinas clay loam, 12 to 20 percent slopes, eroded
CrE2	Colinas clay loam, 20 to 40 percent slopes, eroded
CrF2	Colinas clay loam, 40 to 60 percent slopes, eroded
Cs	Coloso silty clay loam
CuE	Consumo clay 20 to 40 percent slopes
CuF	Consumo clay, 40 to 60 percent slopes
CzC	Corozal clay, 5 to 12 percent slopes
DaC	Daguey clay 2 to 12 percent slopes
DaD	Daguey clay, 12 to 20 percent slopes
DeF	Descalabrado clay loam, 40 to 60 percent slopes
DgF	Descalabrado-Rock outcrop complex, 40 to 60 percent slopes
Dm	Dique loam
Dr	Durados sandy loam
Es	Estacion silty clay loam
GuF	Guayama clay loam, 20 to 60 percent slopes
Hm	Humacao loam
HtE	Humatas clay, 20 to 40 percent slopes
HtF	Humatas clay, 40 to 60 percent slopes
HuF	Humatas-Rock outcrop complex, 20 to 60 percent slopes
Hy	Hydraquents, saline
JaE2	Jagueyes loam, 20 to 40 percent slopes, eroded
JnD2	Juncal clay, 5 to 20 percent slopes, eroded
JuC	Juncos clay, 5 to 12 percent slopes
JuD	Juncos clay, 12 to 20 percent slopes
LaB	Lares clay, 2 to 5 percent slopes
LaC2	Lares clay, 5 to 12 percent slopes, eroded
LmE	Limones clay, 20 to 40 percent slopes
LmF	Limones clay, 40 to 60 percent slopes
LoF2	Lirios silty clay loam, 20 to 60 percent slopes, eroded
LsE	Los Guineos clay, 20 to 40 percent slopes
LsF	Los Guineos clay, 40 to 60 percent slopes
MaA	Mabi clay, 0 to 2 percent slopes
MaB	Mabi clay, 2 to 5 percent slopes
MaC	Mabi clay, 5 to 12 percent slopes
Md	Made land
M1F	Malaya clay loam, 40 to 60 percent slopes
MoF	Maricao clay, 20 to 60 percent slopes
Mp	Martin Pena muck
MsB	Matanzas clay, 2 to 5 percent slopes
MtB	Montegrande clay, 2 to 5 percent slopes
MtC	Montegrande clay, 5 to 12 percent slopes
MuF2	Morado clay loam, 40 to 60 percent slopes, eroded
MxD	Mucara clay, 12 to 20 percent slopes
MxE	Mucara clay, 20 to 40 percent slopes
MxF	Mucara clay, 40 to 60 percent slopes
NaD2	Naranjito silty clay loam, 12 to 20 percent slopes, eroded
NaE2	Naranjito silty clay loam, 20 to 40 percent slopes, eroded
NaF2	Naranjito silty clay loam, 40 to 60 percent slopes, eroded
PaD	Pandura sandy loam, 12 to 20 percent slopes
PaE	Pandura sandy loam, 20 to 40 percent slopes
PaF	Pandura sandy loam, 40 to 60 percent slopes
PeF	Pellejas clay loam, 40 to 60 percent slopes.
Re	Reilly sandy loam
RoB	Rio Arriba clay, 2 to 5 percent slopes
RoC2	Rio Arriba clay, 5 to 12 percent slopes, eroded
RpD2	Rio Piedras clay, 12 to 20 percent slopes, eroded
RpE2	Rio Piedras clay, 20 to 40 percent slopes, eroded
RpF2	Rio Piedras clay, 40 to 60 percent slopes, eroded
SaF	Sabana silty clay loam, 40 to 60 percent slopes
ScB	Sabana Seca clay, 2 to 8 percent slopes
Sm	Saladar muck
SoE	Soller clay loam, 20 to 40 percent slopes
SoF	Soller clay loam, 40 to 60 percent slopes
TaF	Tanama-Rock outcrop complex, 20 to 60 percent slopes
To	Toa silty clay loam
TrB	Torres loamy sand, 2 to 5 percent slopes
Ts	Tropopsamments
Ud	Urban land-Durados complex
Um	Urban land-Mucara complex
Us	Urban land-Sabana Seca complex
Uv	Urban land-Vega Alta complex
VaB	Vega Alta clay loam, 2 to 5 percent slopes
VaC2	Vega Alta clay loam, 5 to 12 percent slopes, eroded
Vg	Vega Baja silty clay
VkC2	Via clay loam, 5 to 12 percent slopes, eroded
Vv	Vivi loam
YeE	Yunes silty clay loam, 20 to 40 percent slopes
YeF	Yunes silty clay loam, 40 to 60 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; POOL; LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (79)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; W)

PITS

- Gravel pit (Gravero)
- Mine or quarry (Cantera)

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; W)
- Intermittent (Int; I)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot
- Oxidation

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (CeA; FoB2)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot


162 000 METERS
72 000 METERS
ATLA
MUNICIPIO DE VEGA ALTA
MUNICIPIO DE DORADO
ScB
BmB


ATLANTIC OCEAN
Punta Mameyes
Ts
Playa de Sardinera
Laguna Mata Redondo
Ud
w
Campo de Golf
693
Aeropuerto Dorado
(Joins sheet 2)
MUNICIPIO DE VEGA ALTA
MUNICIPIO DE DORADO
HIGUILLAR
ScB
Mp
AmB
SOILS NOT SURVEYED
San Antonio
TaF
MsB
BmB
TrB
681
696
695
Cerros de Higuillar
Higuillar
(Joins sheet 5)
168 000 METERS
N
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000

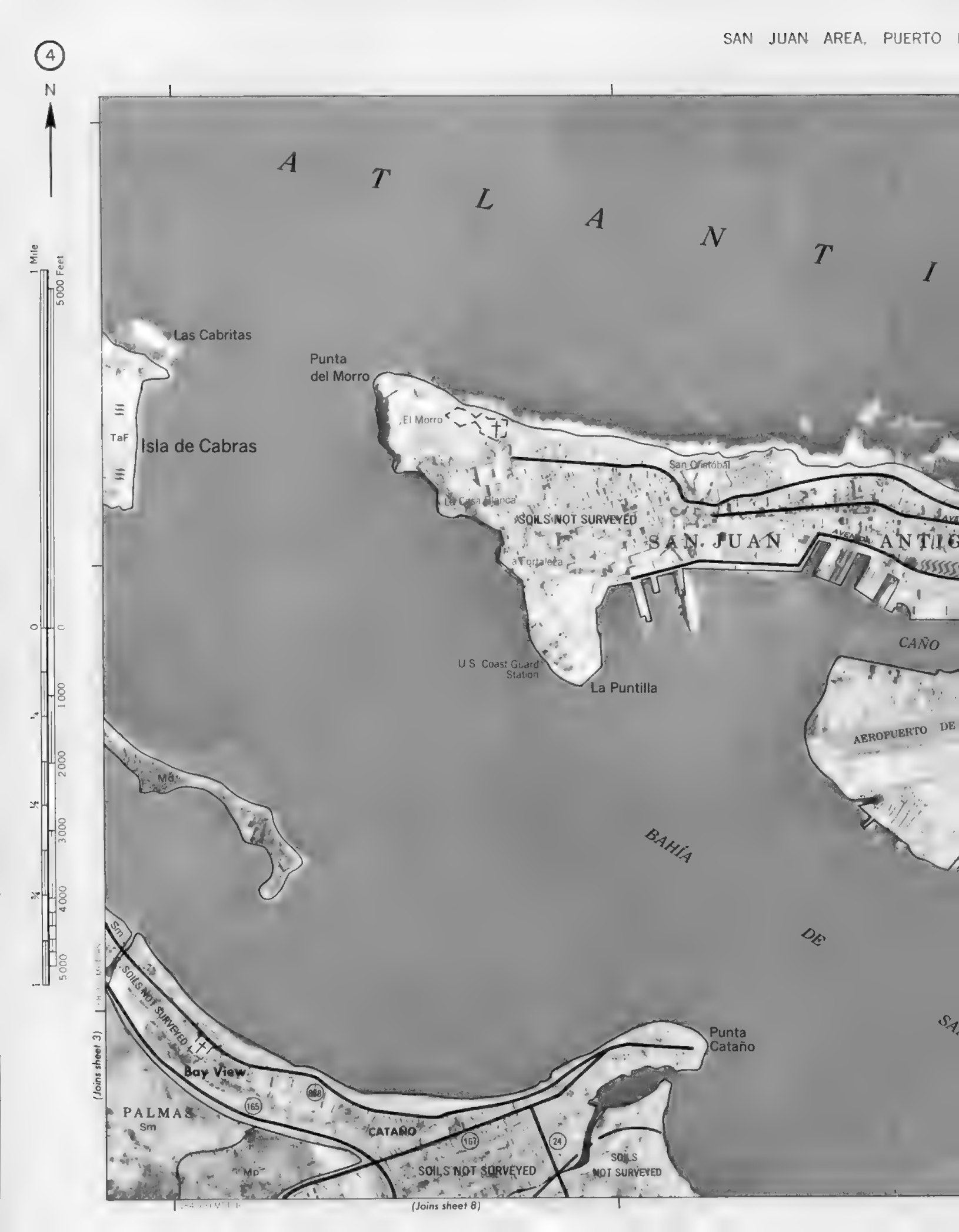

2
N
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
1/4
1/2
3/4
1
5000 METERS
A T L A N T I C
Alto
Las Ovejas
Punta
Frailes
Punta
Boca Juana
HIGUILLAR
Mameyal
DORADO
HIGUILLAR
TOA BAJA
MEDIA
Cocal
RIO DE LA PLATA
RIO DE DORADO
MUNICIPIO
MUNICIPIO
SOILS NOT SURVEYED
Ud
Ba
Hy
AmC
Dr
Ts
Dm
To
Cs
TrB
AmB
Mp
TaF
VaB
w
(Joins sheet 1)
(Joins sheet 6)


C O C E A N
A M E Y A L
B A N A S E C A
EDIA LUNA
MUNICIPIO DE DORADO
MUNICIPIO DE TOA BAJA
Río Cocal
US NAVAL RADIO STATION
SABANA SECA
La Monserrate
Ingenio
US RES
(Joins sheet 3)
Ts
Dr
Hy
Ba
Cs
To
Mp
AmB
ScB
165
867

SAN JUAN AREA,

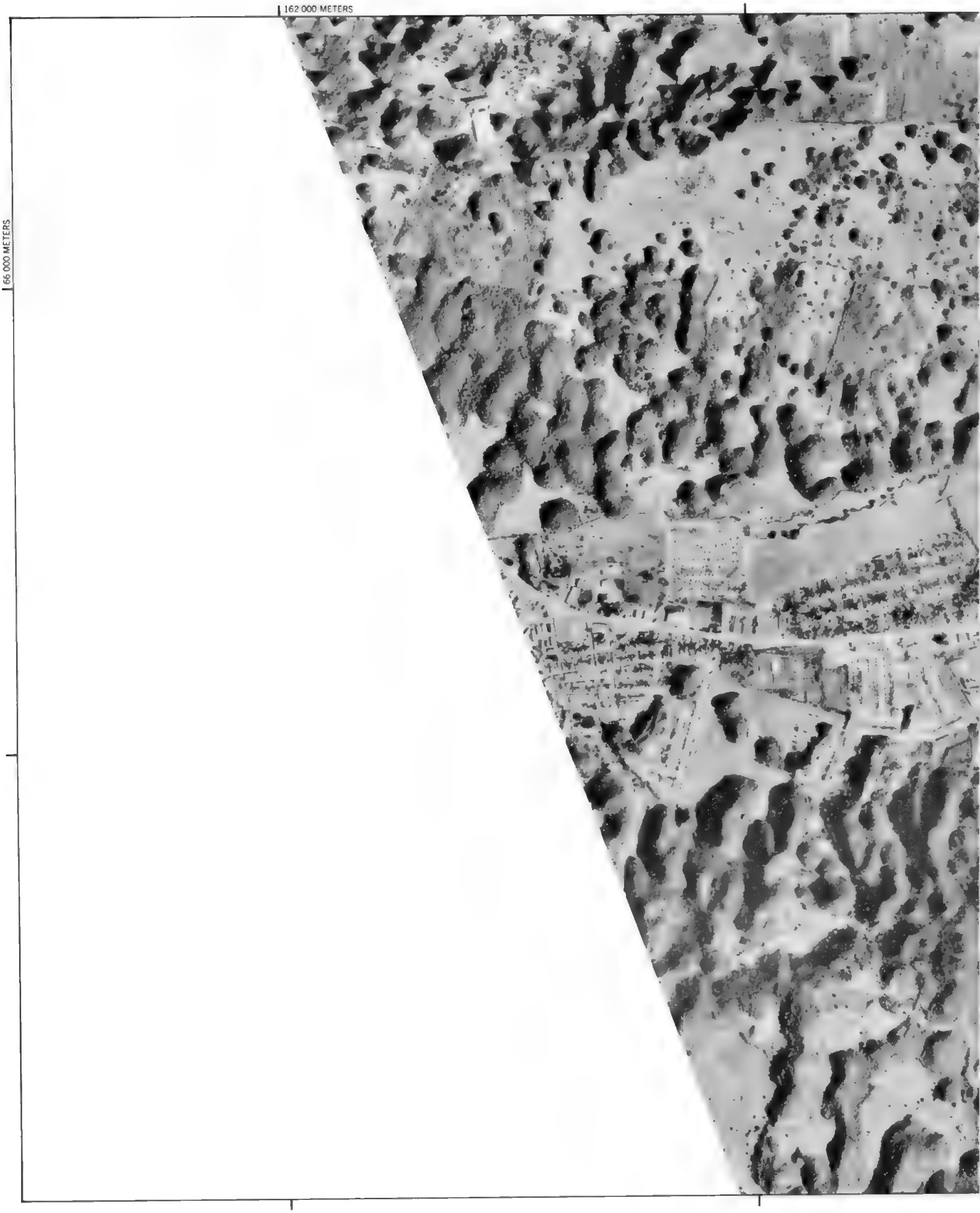
(Joins sheet 2)

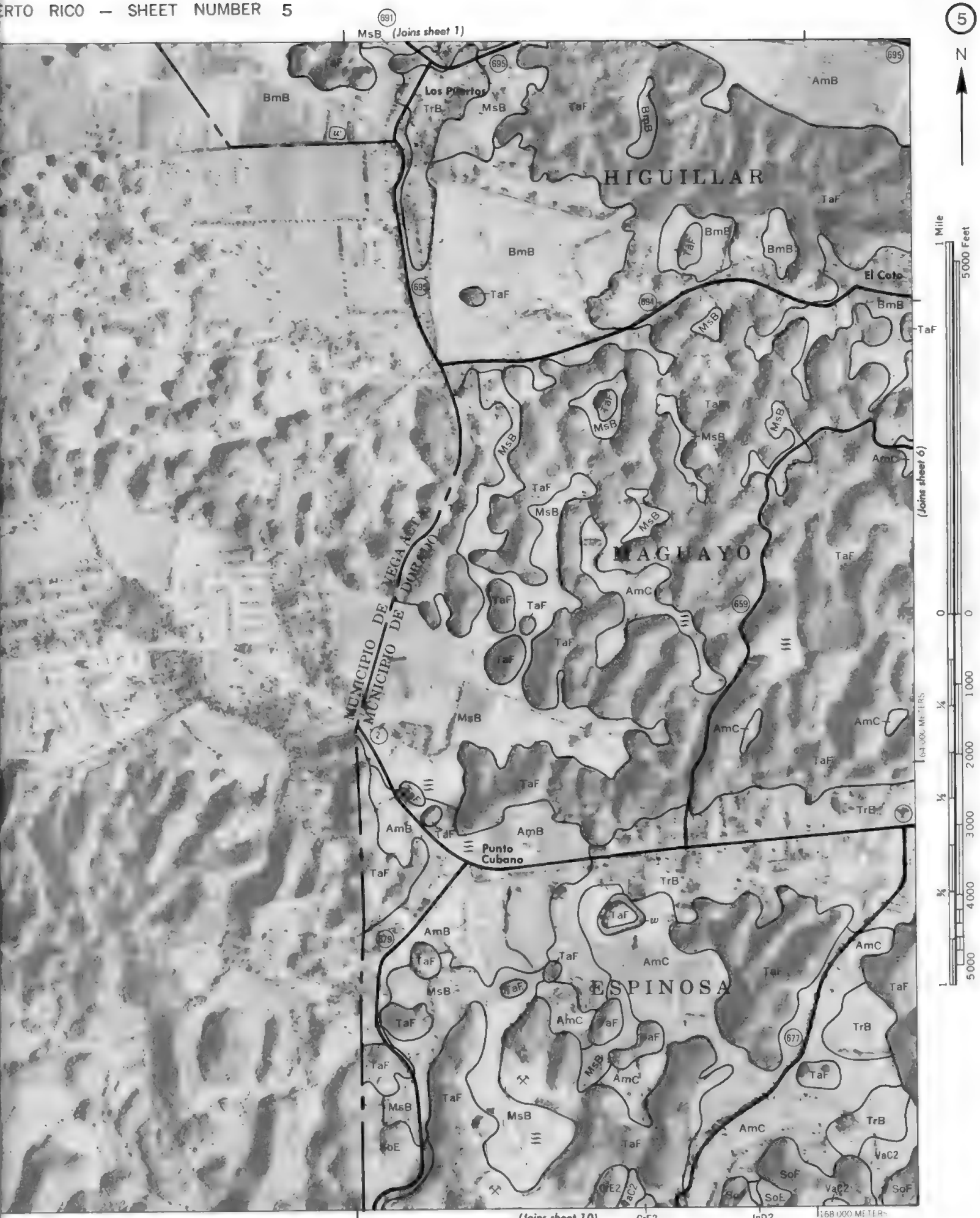
3
N
OCEAN
DE BOCA VIEJA
Isla de Cabras
TaF
Ts
Cn
Punta Tocones
Punta Palo Seco
Palo Seco
870
Ud
Md
Sm
Termoeléctrica de Palo Seco
MUNICIPIO DE TOA BAJA
MUNICIPIO DE BAYAMÓN
MUNICIPIO DE CATAÑO
BAHÍA DE SAN JUAN
888
Hy
water
165
PALO SECO
Dr
866
869
RÍO BAYAMÓN
CANAL RÍO BAYAMÓN
RÍO DE BAYAMÓN
Ciénaga de las Cucharillas
w
P A L M A S
AmB
Planta de Tratamiento de Aguas Negras
Cs
Us
Ba
1 Mile
5 000 Feet
0
¼
½
¾
1 000
2 000
3 000
4 000
(Joins sheet 4)
(Joins sheet 7)
182 000 METERS

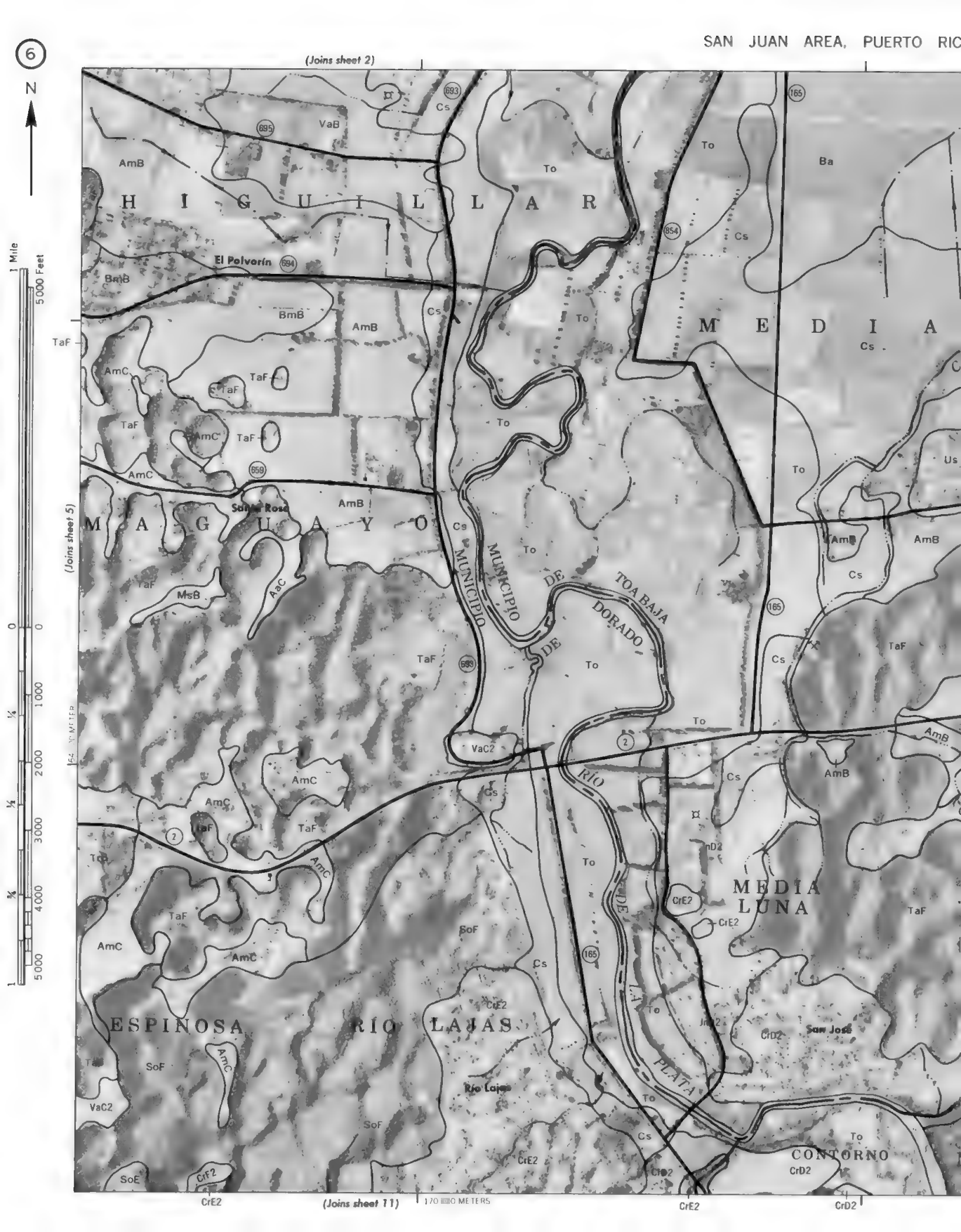

4
N
1 Mile
5000 Feet
0
0
1000
2000
3000
4000
5000
ATLANTI
Las Cabritas
Punta
del Morro
El Morro
TaF
Isla de Cabras
San Cristóbal
La Casa Blanca
SOILS NOT SURVEYED
SAN JUAN
ANTIG
La Fortaleza
CAÑO
U S Coast Guard
Station
La Puntilla
AEROPUERTO DE
Mg
BAHÍA
DE
Sm
SOILS NOT SURVEYED
Punta
Cataño
Bay View
(Joins sheet 3)
PALMAS
Sm
CATAÑO
SOILS NOT SURVEYED
SOILS
NOT SURVEYED
Mp
(Joins sheet 8)


I C O C E A N
Punta Escambrón
SOILS NOT SURVEYED
AVENIDA
AVENIDA
MUÑOZ RIVERA
PONCE DE LEON
ANTIGUO
FERNANDEZ JUNCOS
Fuerte San Jeronimo
CAÑO DE SAN ANTONIO
Punta Piedrita
Laguna del Condado
AVENIDA
Ts
Condado
SOILS NOT SURVEYED
AEROPUERTO DE ISLA GRANDE
SOILS NOT SURVEYED
Miramar
AVENIDA
BALDORIOTY DE CASTRO
AVENIDA
S A N T U R C E
PONCE DE LEON
FERNANDEZ JUNCOS
Tras Talleres
2
EXPRESO
SAN JUAN
SOILS NOT SURVEYED
MUÑOZ RIVERA
SOILS NOT SURVEYED
PUENTE CONSTITUCION
Hy
18
SOILS NOT SURVEYED
(Joins inset, sheet 21)

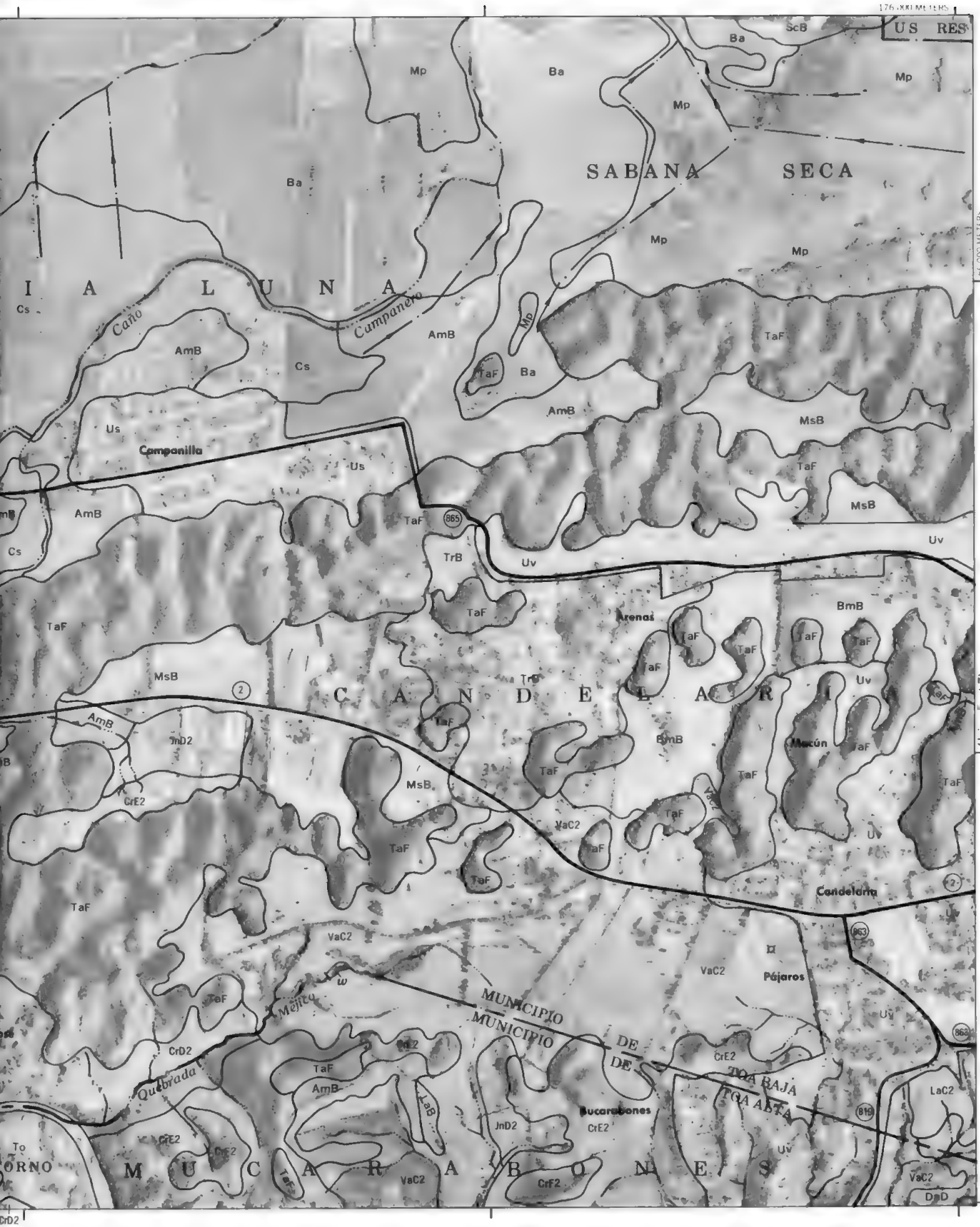
SAN JUAN AREA, PUERTO RICO —

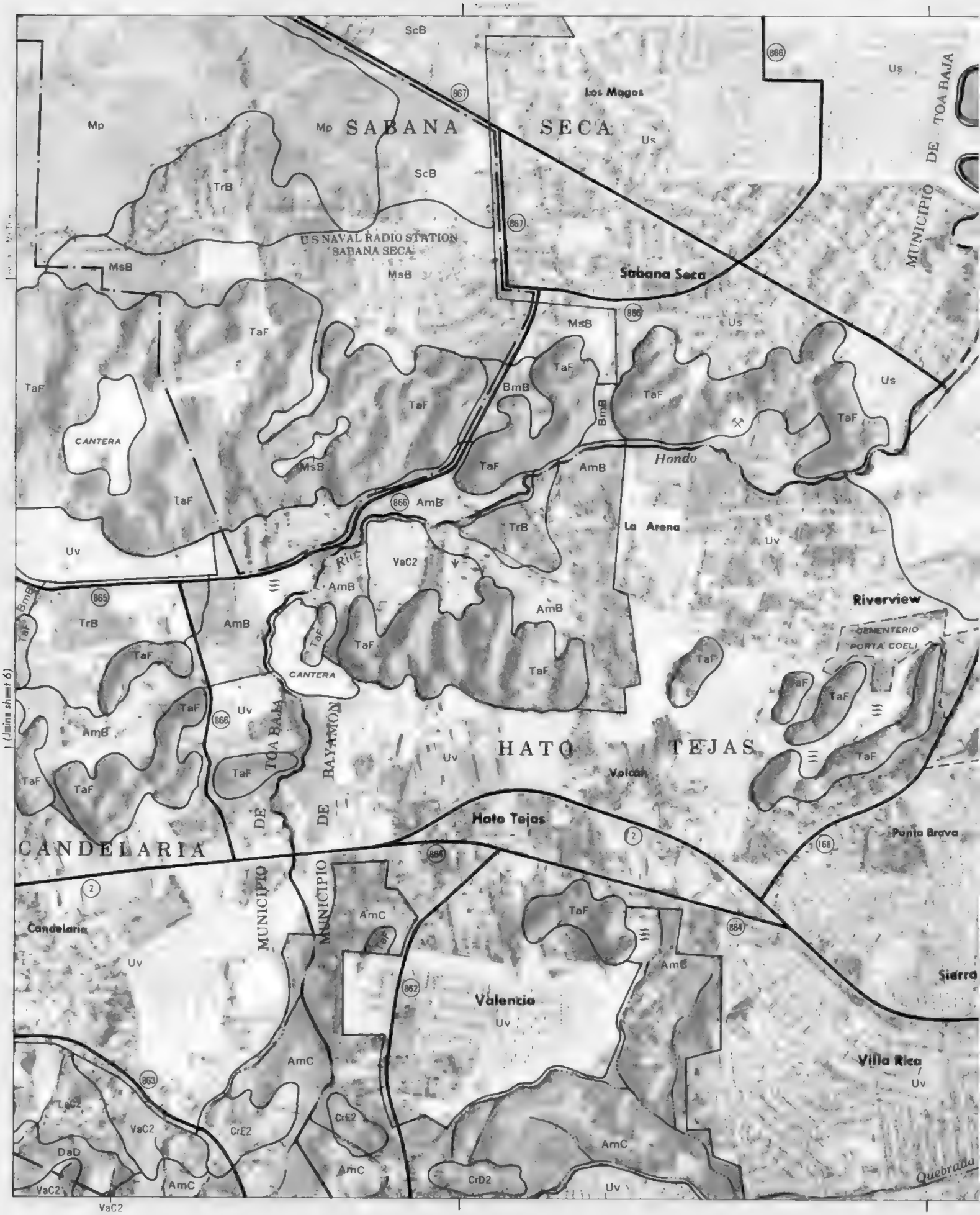



(691)
MsB
(Joins sheet 1)
(695)
Los Puertos
TrB
MsB
TaF
BmB
AmB
HIGUILLAR
El Coto
(694)
(659)
MAGUAYO
MUNICIPIO DE VEGA ALTA
MUNICIPIO DE DORADO
Punto Cubano
(679)
ESPINOSA
(677)
(Joins sheet 6)
(Joins sheet 10)
CrE2
JnD2
SoE
SoF
VaC2
AmC
TrB
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
1/4
1/2
3/4
1
64 000 METERS
168 000 METERS
N


N
(Joins sheet 2)
(Joins sheet 5)
(Joins sheet 11)
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
METERS
170 METERS
HIGUILLAR
MEDIA
MAGUAYO
ESPINOSA
RIO LAJAS
MEDIA LUNA
CONTORNO
El Polvorín
Santa Rosa
San José
Río Lajas
MUNICIPIO DE TOA BAJA
MUNICIPIO DE DORADO
RIO LA PLATA
VaB
AmB
BmB
TaF
AmC
MsB
AaC
VaC2
SoF
SoE
CrF2
CrE2
CrD2
To
Cs
Ba
Us
693
695
694
859
854
165
2

PUERTO RICO — SHEET NUMBER 6




SABANA SECA
HATO TEJAS
CANDELARIA
MUNICIPIO DE TOA BAJA
MUNICIPIO DE BAYAMÓN
U S NAVAL RADIO STATION SABANA SECA
Los Magos
Sabana Seca
Hondo
La Arena
Riverview
CEMENTERIO PORTA COELI
Hato Tejas
Punta Brava
Volcán
Valencia
Villa Rica
Sierra
Quebrada
CANTERA
Río
ScB
Mp
TrB
MsB
TaF
BmB
AmB
VaC2
AmC
CrE2
CrD2
DaD
LaC2
Us
Uv


(Joins sheet 3)
(Joins sheet 8)
(Joins sheet 12)
182 000 METERS
N
1 Mile
5000 Feet
PALMAS
Cucharillas
Las Vegas
Las Palmas
MUNICIPIO DE TOA BAJA
MUNICIPIO DE CATAÑO
MUNICIPIO DE BAYAMÓN
RÍO DE BAYAMÓN
CANAL
RÍO
BAYAMÓN
EXPRESO DE DIEGO
Riverview
CEMENTERIO PORTA COELI
PUERTO RICO NATIONAL CEMETERY
CANTERA
Monte de Santa Ana
JUAN SÁNCHEZ
Punta Brava
Sierra Bayamón
Catalina
Villa Rica
Vista Alegre
Quebrada
Santa
Río Hondo
BAYAMÓN
Santa Rosa
Villa España


(Joins sheet 4)
N
1 Mile
5000 Feet
(Joins sheet 7)
(Joins sheet 13)
CATAÑO
SOILS NOT SURVEYED
Juana Matos
PALMAS
Amelia
Sabana
Bahia de Puerto
Puente Blanco
MUNICIPIO DE CATAÑO
MUNICIPIO DE GUAYNABO
MUN DE BAYAMON
EXPRESO
DE DIEGO
U S NAVAL RESERVATION
Tanque de Agua
Montes
Caneja
PUEBLO VIEJO
Canal
Santa
Campo de Golf
JUAN SÁNCHEZ
U S MILITARY RESERVATION
Villa Caparra
Caparra Hills
MUNICIPIO
Margarita
Summit Hills
Altamira
CAPARRA
Garden Hills
Suchville
Jardines de Caparra
Quebrada
Planta de tratamiento
Aguas Negras
Sm
Mp
AmB
VaB
TaF
AmC
Uv
DaD
water

PUERTO RICO — SHEET NUMBER 8


192 000 METERS
(Joins inset, sheet 21)
(Joins sheet 8)
SANTURCE
Barrio Obrero
SOILS NOT SURVEYED
CAÑO DE MARTIN PEÑA
Las Casas
Hy
Isla Guachinango
Martín Peña
SOILS NOT SURVEYED
HATO REY NORTE
AVENIDA
AVENIDA
FRANKLIN D. ROOSEVELT
Cantera
LAGUNA
MUNICIPIO DE
MUNICIPIO DE
SAN
HATO REY CENTRAL
San José
Truman
SOILS NOT SURVEYED
Pérez Morris
Juan Mendez
ORIENTE
SOILS NOT SURVEYED
Baldrich
PONCE DE LEON
MUÑOZ RIVERA
Valencia
UNIVERSIDAD
Villa
AVENIDA JESÚS T. PIÑERO
Hyde Park
Los Maestros
Quebrada
HATO REY SUR
SOILS NOT SURVEYED
DR. BARBOSA
SOILS NO
Río
Santa Ana
Santa Rita
Piedras
Río Piedras
To
VaB
EL CINCO
Vg
PUEBLO
UV
Buen Consejo
SOILS NOT SURVEYED
Reparto Universitario
San Augustín
AVENIDA
REGIMIEN
RpD2
YeF
UV
To
UV
181
Villa Capri


9
N
1 Mile
5000 Feet
MUNICIPIO DE CAROLINA
UNICIPIO DE SAN JUAN
SAN JOSÉ
Hy
Quebrada San Antón
AmB
Md
Campo Rico
Villa Prades
SABANA LLANA NORTE
Parcelas Falú
SOILS NOT SURVEYED
Country Club
SOILS NOT SURVEYED
Reparto Sevilla
AmB
REGIMIENTO 65 DE INFANTERÍA
Los Peñas
SABANA LLANA SUR
San Martín
Sabana Llana
Uv
MUNICIPIO DE CAROLINA
Quebrada
Capri
(Joins sheet 14)
198 000 METERS
64 000 METERS

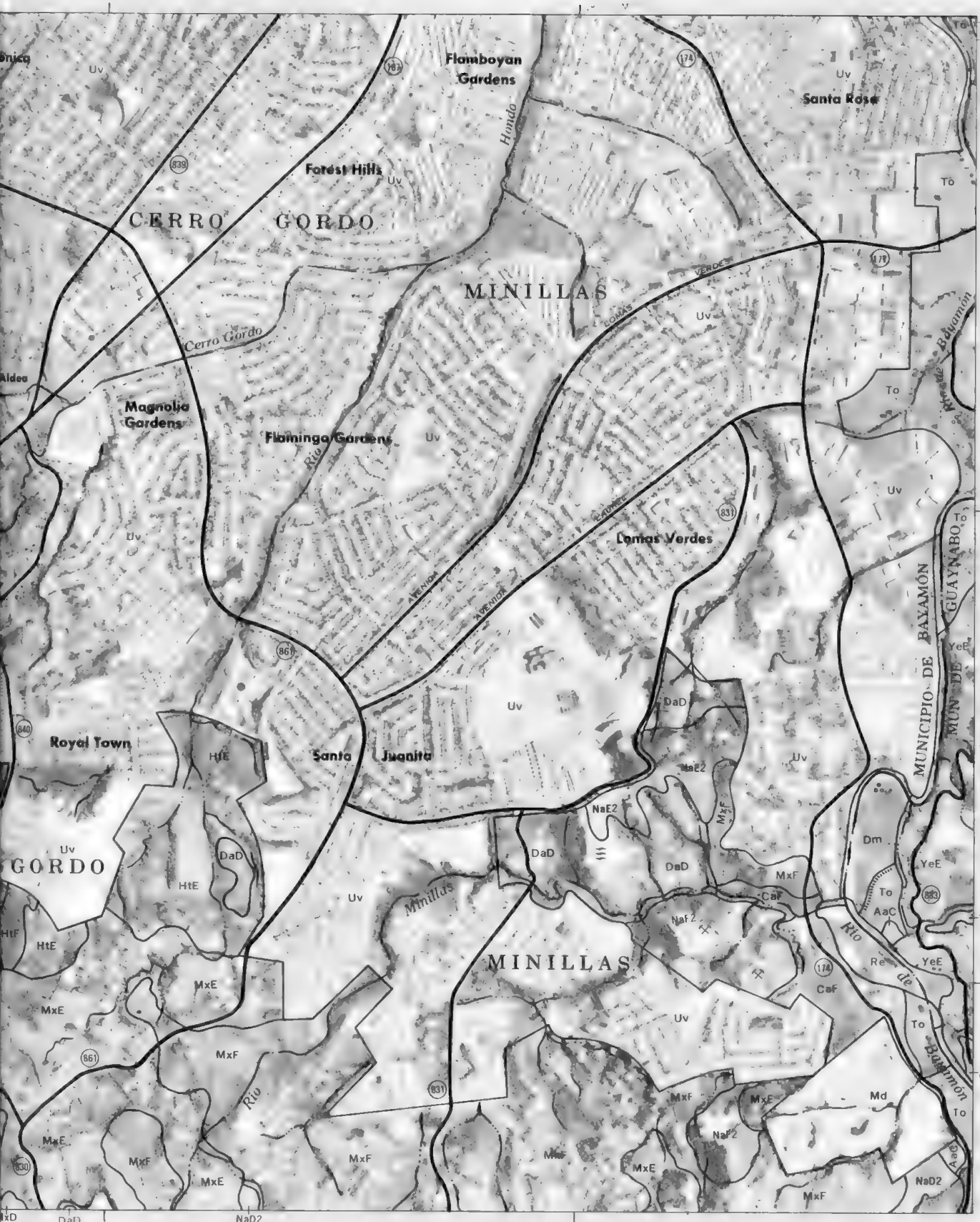

10
N
1 Mile
5000 Feet
0
0
¼
1000
2000
½
3000
¾
4000
5000
1
(Joins inset, sheet 15)
58 000 METERS
162 000 METERS
(Joins sheet 16)
MUNICIPIO DE VEGA ALTA
MUNICIPIO DE
Río
MUNICIPIO
DE
CrF2
CrE2
SoE
SoF
DaD
A
B
R
CrE2
SoF
SoE
JnD2
Río
Cibuco
VaC2
MUN
DE
MUN
DE
VEGA ALTA
COROZAL
C I B U C O
To
JnD2
SoE
LaC2
SoE
SoF
JnD2
Cibuco
Río
HtE
RpE2
818
HtE
LaC2
Río
Corozal
CrE2
SoF
SoF
SoF
SoF
CuE
PUEBLO
VaC2
SoE
VaC2
HtE


(Joins sheet 5)
MUN. DE DORADO
MUNICIPIO DE TOA ALTA
MUNICIPIO DE TOA ALTA
MUNICIPIO DE TOA ALTA
COROZAL
QUEBRADA ARENAS
PALMAREJO
Río Lajas
Río Lajas
Río Marilla
Río
(Joins sheet 11)
SoE
SoF
AmC
AmB
VaC2
VaB
TaF
CrD2
CrE2
CrF2
JnD2
CuE
CuF
AaC
RoB
677
679
820
823
806
159


CrF2
CrE2
NaF2
(Joins sheet 11)
RÍO LAJAS
MUNICIPIO DE DORADO
MUNICIPIO DE TOA ALTA
TOA ALTA
ESPINOSA
CONTORNO
RÍO LAJAS
Hoyo Prieto
Arenas
QUEBRADA ARENAS
Quebrada
Galateo
GALATEO
QUEBRADA CRUZ
Quebrada Arenas
Quebrada
Cruz
RÍO LA PLATA
165
861
824
823
804
808


(Joins sheet 6)
Bucarabones
Las Arenas
Quebrada La Concha
Quebrada
Quebrada
Río
PLATA
MUCARABONES
Piña
Pájaros
La Prá
PIÑA
PORTUGUES
RIO
GRAVERO
(Joins sheet 12)
(Joins sheet 17)
1 Mile
5000 Feet
N


N
DaD
(Joins sheet 7)
AmC
VaC2
CrD2
LaC2
CaC2
Santa Mónica
Uv
PAJAROS
Sierra Linda
MUCARABONES
Bayamón Gardens
La Aldea
Alegría
Royal Gardens
Escarcha
ALTA
BAYAMON
Faría
San Sebastián
Quebrada
(Joins sheet 11)
DE TOA
DE
MUNICIPIO
RpE2
LaB
ORTIZ
CERRO
GORDO
HtE
HtF
MxD
MxE
MxF
Van Scoy
(Joins sheet 18)
5000 Feet
1 Mile
1000 METERS


Flamboyan Gardens
Santa Rosa
Forest Hills
CERRO GORDO
MINILLAS
Hondo
Cerro Gordo
Magnolia Gardens
Flamingo Gardens
Río
Lomas Verdes
LOMAS VERDE
AVENIDA
Río de Bayamón
MUNICIPIO DE BAYAMÓN
GUAYNABO
(Joins sheet 13)
Royal Town
Santa Juanita
Minillas
Río
Uv
To
YeE
YeF
AaC
DaD
HtE
HtF
MxE
MxF
NaE2
NaF2
CaF
Dm
Md
NaD2


Jardines de Caparra
Quebrada
El Manguito
Torrimar
Santiago
MUNICIPIO DE BAYAMON
MUNICIPIO DE GUAYNABO
Observatorio Magnético
Planta de Purificación
Río Bayamón
Río Guaynabo
Muñoz Rivera
Ponce de León
Santa Rosa Tres
La Esperanza
GUAYNABO
SANTA ROSA
Santa Rosa
Canta Gallo
CAMARONES
Quebrada
Río
(Joins sheet 12)
SOILS N
Uv
Cs
To
Re
YeE
YeF
RpD2
RpE2
RpF2
AaC
DaD
HtF
LaC2
MxD
MxE
MxF
NaE2
NaF2
BpD2
Tp
w
177
833
838
847
20
21
MxE
HtE
HtF


(Joins sheet 8)
SOILS NOT SURVEYED
Uv
Santiago Iglesias
College Park
MUNICIPIO DE GUAYNABO
MUNICIPIO DE SAN JUAN
MONACILLO URBANO
San Francisco
CEMENTERIO DE LA CAPITAL
Quebrada Josefina
Quebrada Buena Vista
Quebrada Mongil
De Diego
San Fernando
Santa Maria
Parkville
Villa Clementina
Bucaré
MONACILLO
La Cumbre
El Mirador
Frailes
Sierra Brava
CAIMITO
TORTUGO
Piedras
Rio
LaC2
DaD
NaE2
NaF2
NaD2
MxF
HtE
HtF
(Joins sheet 14)
(Joins sheet 19)
190 000 METER
1 Mile
5000 Feet
13
N

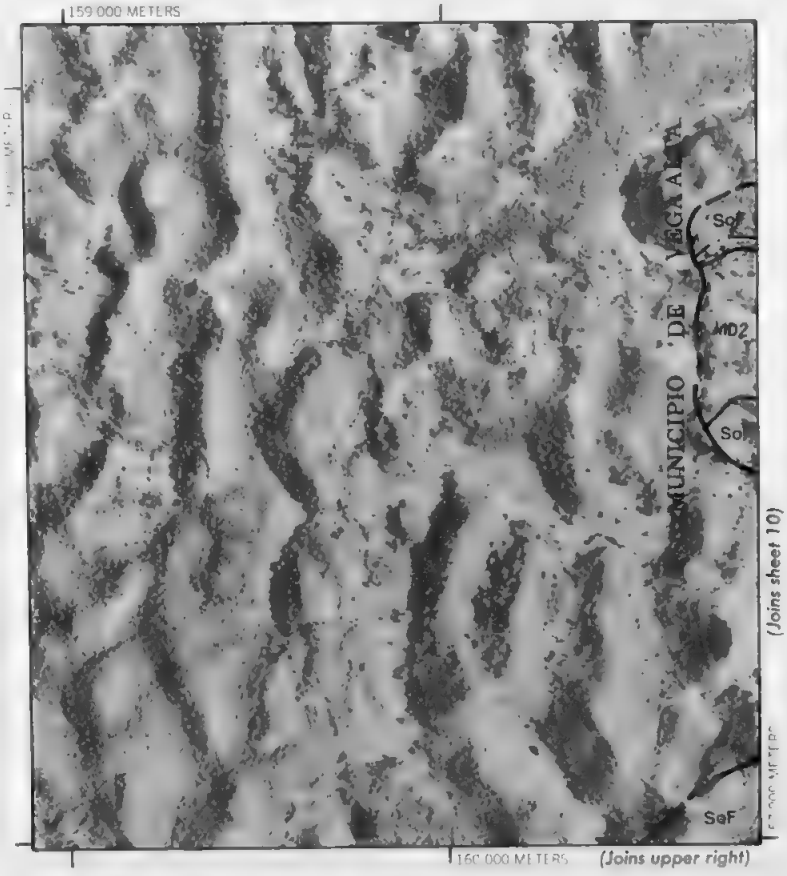

(Joins sheet 9)
N
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
PUEBLO
SOILS NOT SURVEYED
Park Gardens
ESTACION EXPERIMENTAL AGRICOLA
SABANA
Villa Andalucia
MONTES
San Fernando
San Gerardo
Sagrado Corazón
Fairview
La Marina
Quebrada Los Guanos
Quebrada Piedras
Río
Guaraguao
MUNICIPIO DE SAN JUAN
MUNICIPIO DE TRUJILLO
CAPARRA
CUPEY
(Joins sheet 13)
(Joins sheet 20)

(Joins inset, sheet 37)

154 000 METERS

56 000 METERS

159 000 METERS



160 000 METERS

(Joins upper right)

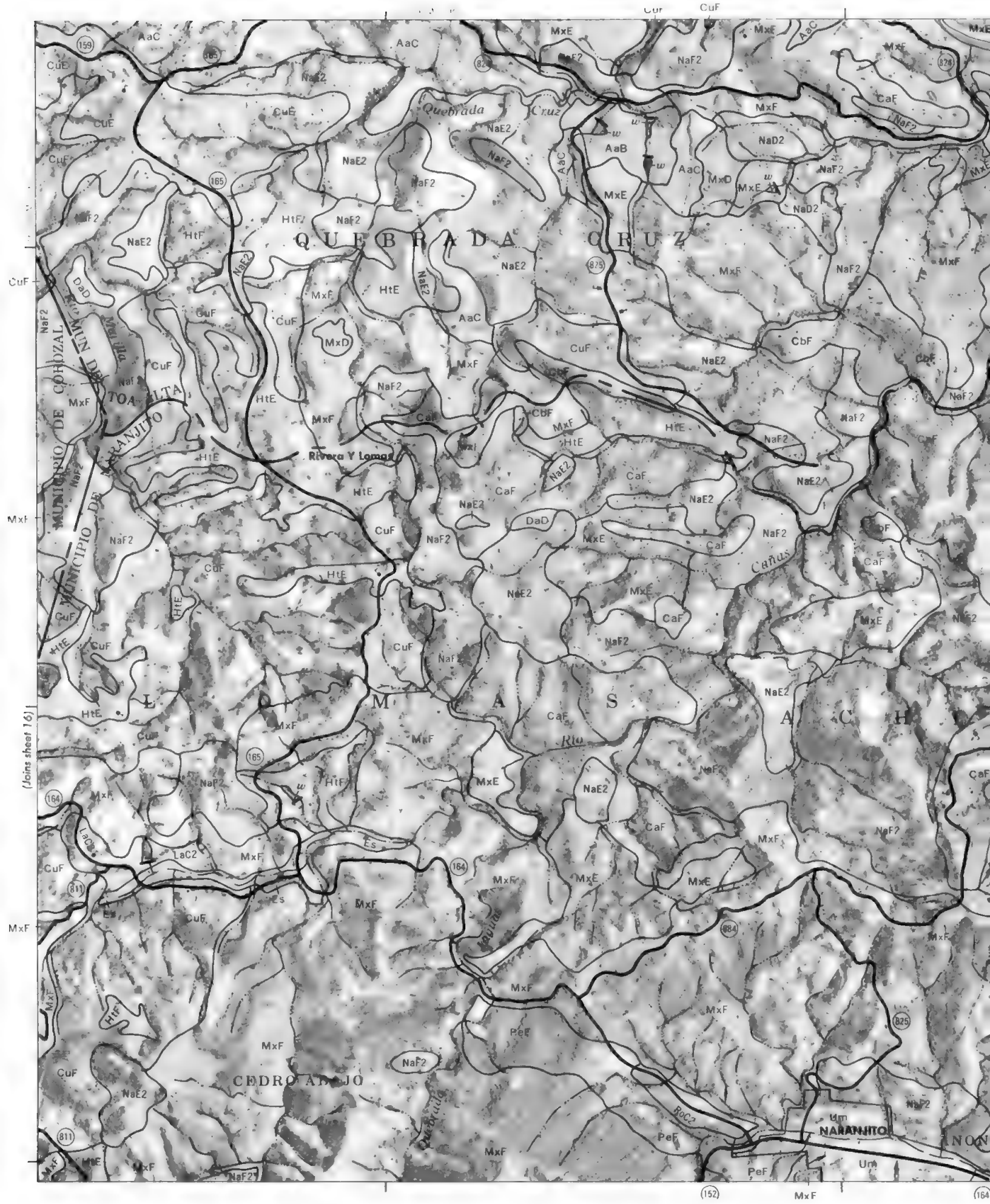
(Joins sheet 10)

1000 AND 2000 METER GRID TICKS

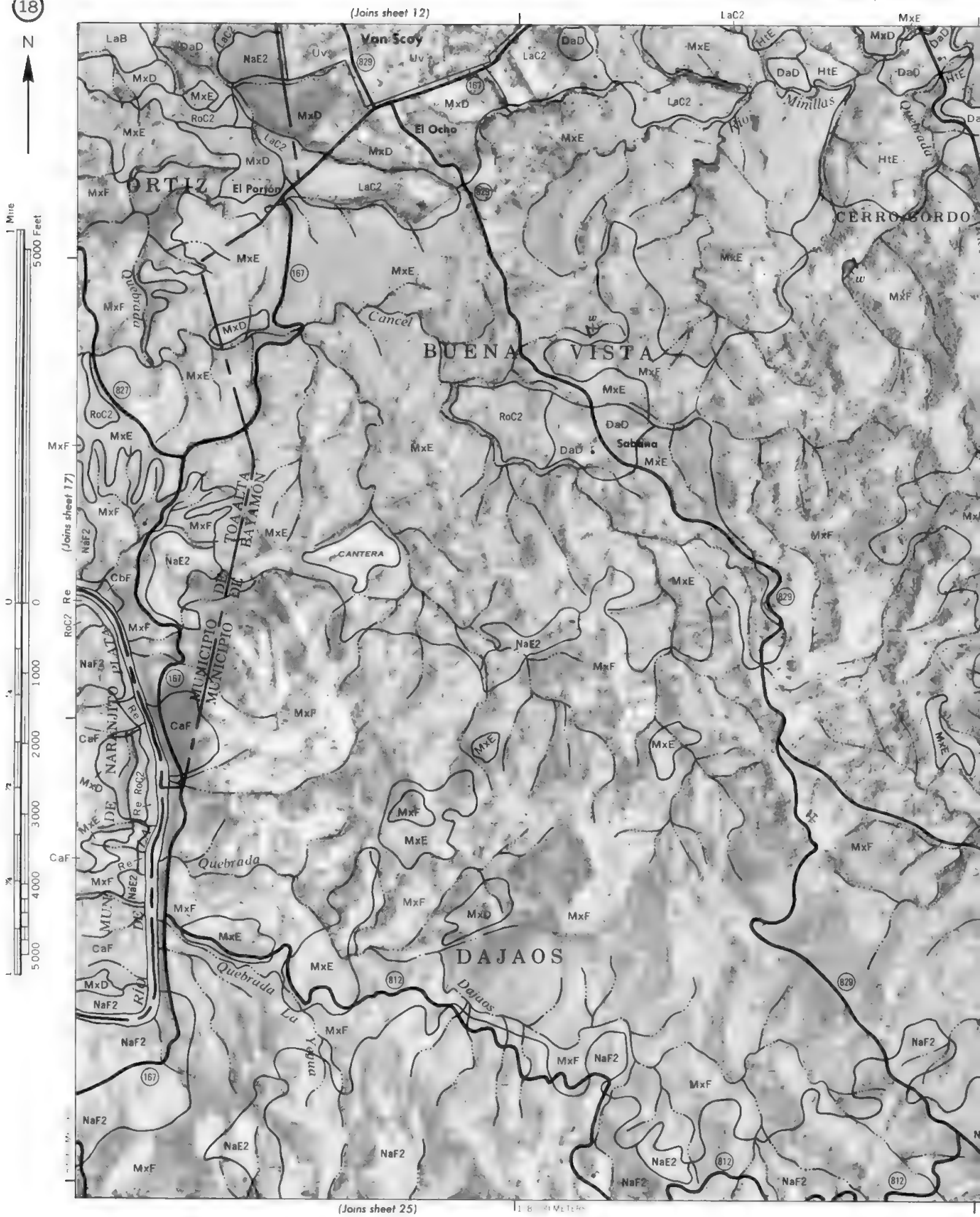

(Joins inset)
15
N
MUNICIPIO DE VEGA ALTA
MUNICIPIO DE COROZAL
MUNICIPIO DE
PADILLA
SoF
JnD2
CrE2
LaC2
CzC
CuF
HtE
HtF
DaD
MxF
RoC2
Jet
Estación Experimental
1 Mile
5000 Feet
(Joins sheet 16)
(Joins sheet 22)
160 000 METERS
618

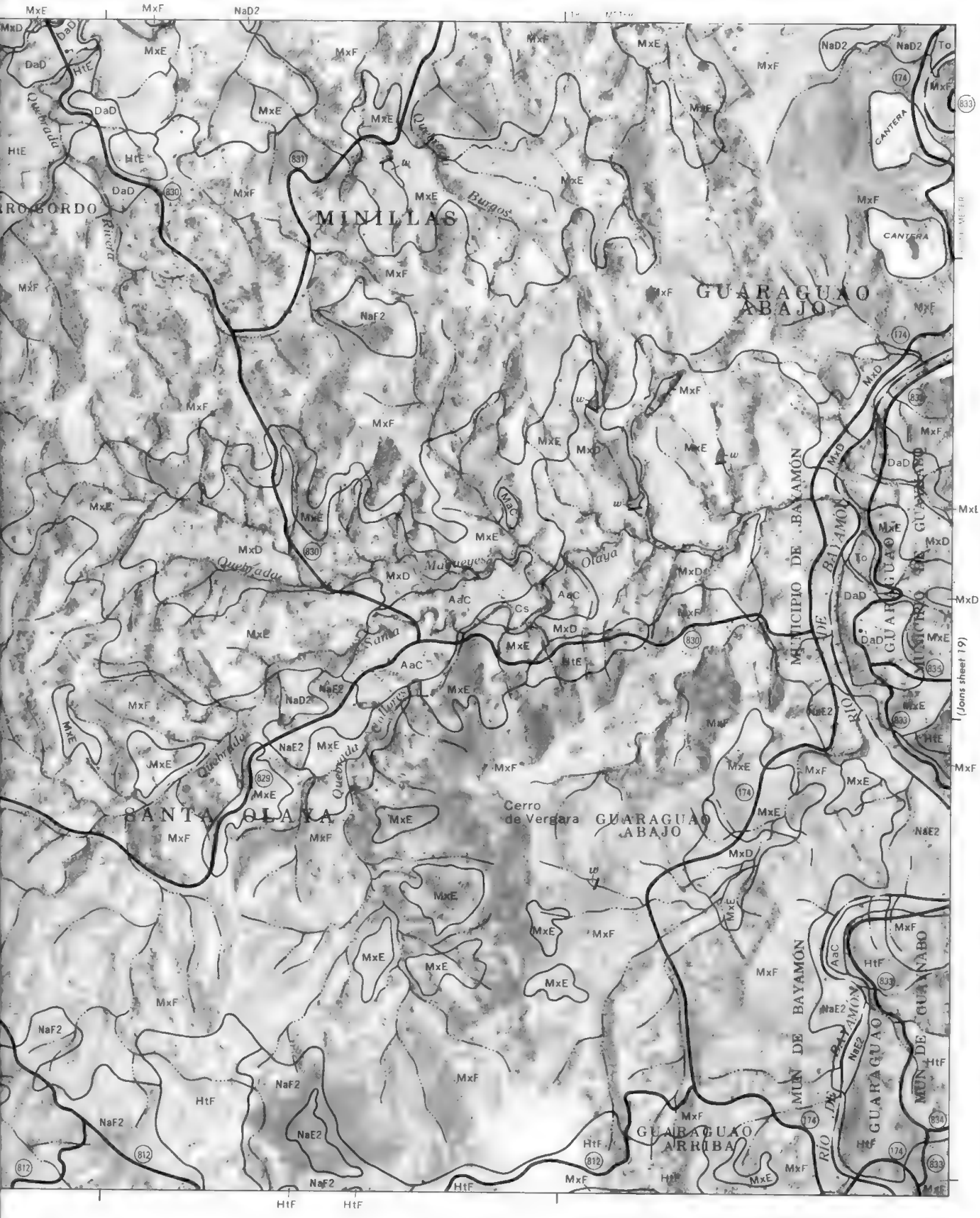

16
N
(Joins sheet 10)
(Joins sheet 15)
(Joins sheet 23)
1 Mile
5000 Feet
CIBUCO
PADILLA
DOS BOCAS
Río Cibuco
Río Corozal
Río Dos Bocas
Río
Padilla
Ortiz
To
Uv
JnD2
LaC2
VaC2
CrE2
SoF
SoE
HtE
HtF
TaF
Es
CuF
CzC
DaD
MaC
MxF
MxE
YeF
CuE
RoC2
NaF2
NaE2
CaF
CbF
818
159
807
568
618


COROZAL
PUEBLO
PALMAREJO
BOCAS
PALOS BLANCOS
MUNICIPIO DE TOA ALTA
MUNICIPIO DE COROZAL
MUNICIPIO DE NARANJITO
Río Negro
Río Los Negros
Río Marvilla
(Joins sheet 17)
159
807
164
803
811
CuF
HtE
MxF
NaF2
DaD
AaC
VaC2
LaC2
MxE
CuE
SoF
Uv
To
Ortiz
Es
MxD
CaF

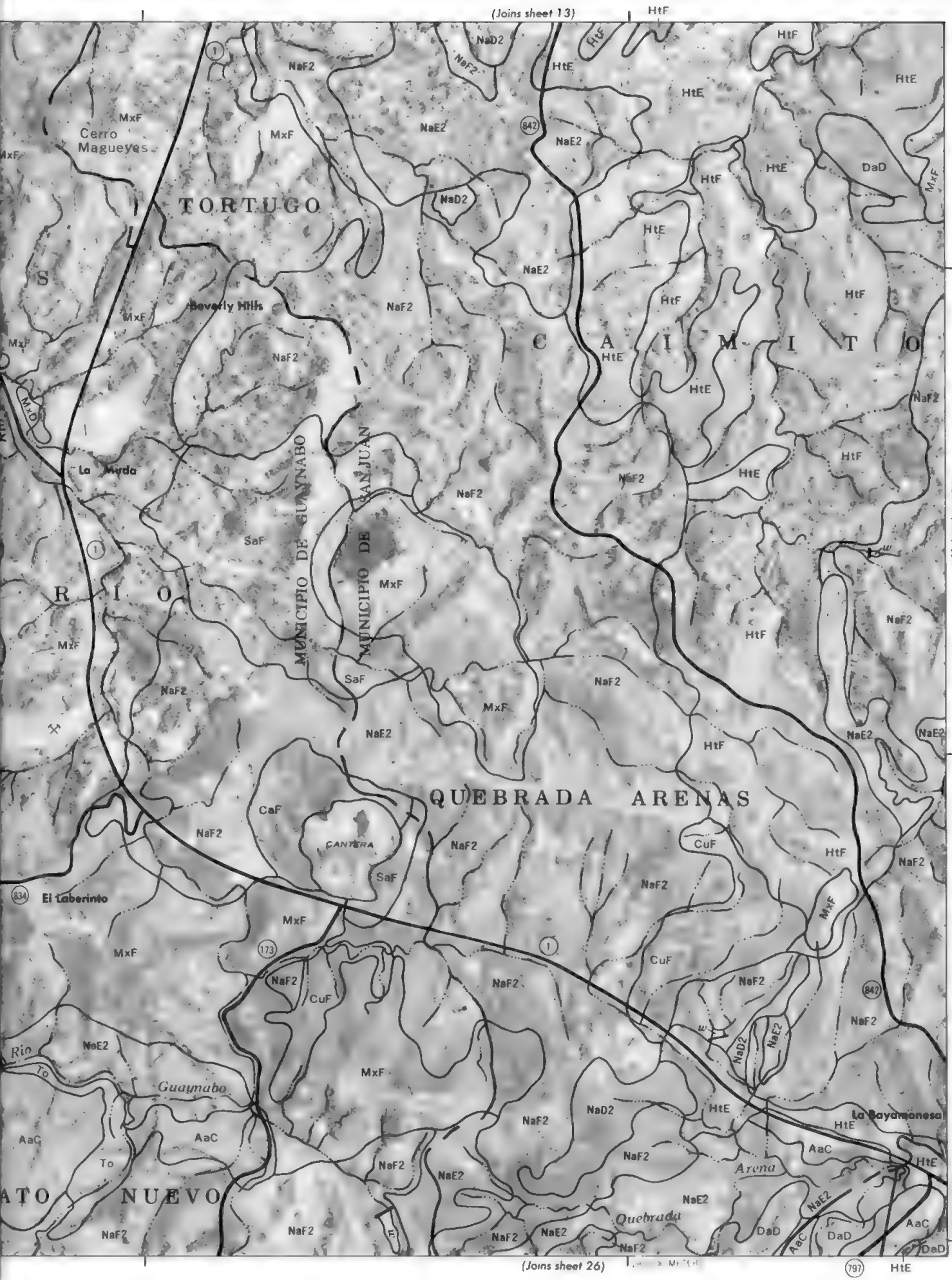

QUEBRADA CRUZ
Quebrada Cruz
Rivera Y Lomas
MUNICIPIO DE CAMUY
MUNICIPIO DE CORDOVA
MUNICIPIO DE ARANJITO
TOA ALTA
CEDRO ABAJO
NARANJITO
Río Cañas
Quebrada
(Joins sheet 16)
AaB
AaC
CaF
CbF
CuE
CuF
DaD
HtE
HtF
LaC2
MxD
MxE
MxF
NaD2
NaE2
NaF2
PeF
RoC2

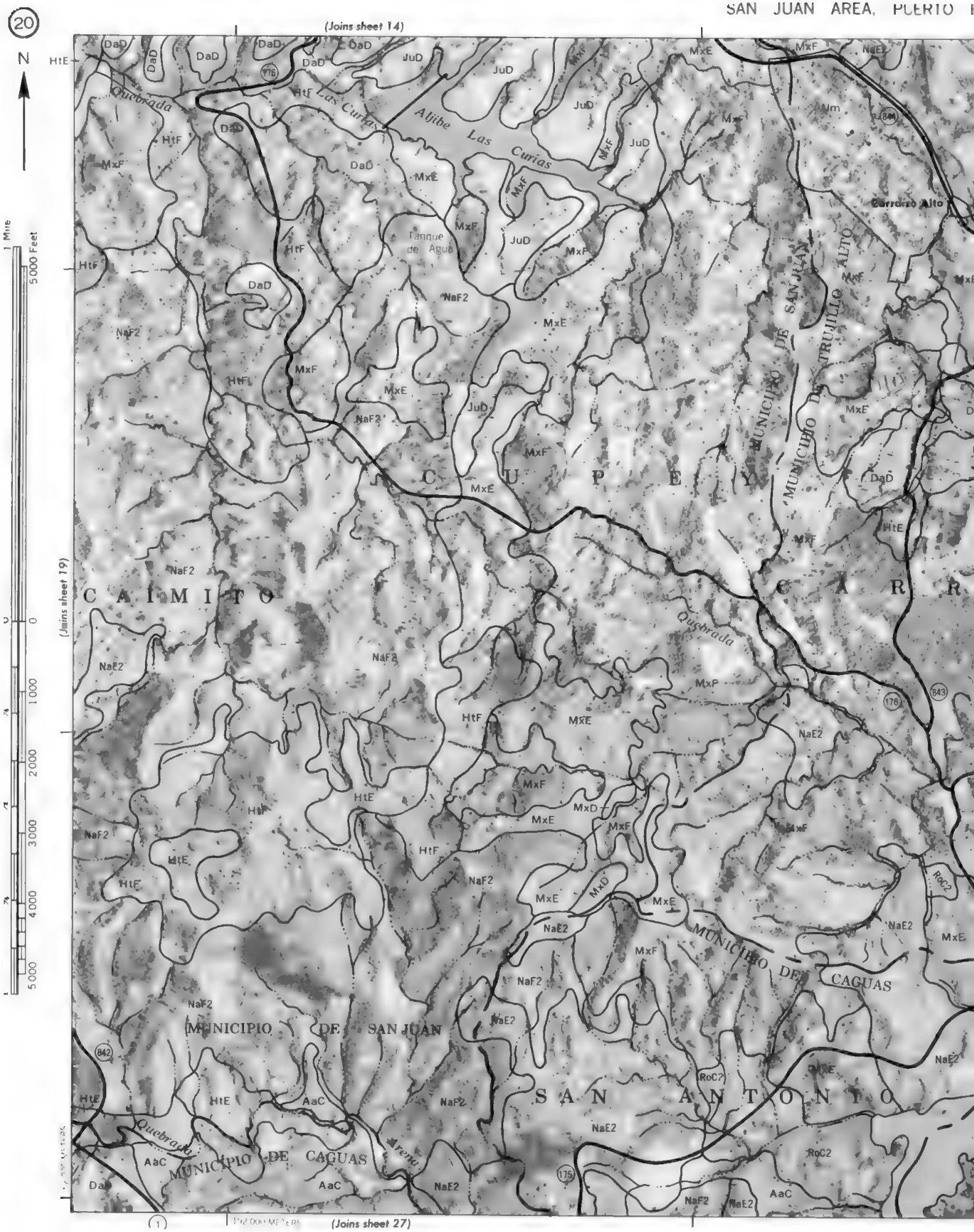

(Joins sheet 11)
(Joins sheet 18)
(Joins sheet 24)
17
N
1 Mile
5000 Feet
CANTERA
GRAVERO
PLATA
GUADIANA
NUEVO
Quebrada Cancel
Río de la Plata
MxE
MxD
MxF
CaF
NaF2
NaE2
AaC
AaB
MaB
MaC
CbF
GaF
LaB
RpE2
RoC2
HtF
HtE
WtE
Re
To


(Joins sheet 12)
N
1 Mile
5000 Feet
ORTIZ
El Porton
Von Scoy
El Ocho
BUENA VISTA
CERROGORDO
Sabana
Millas
Cancel
Quebrada
CANTERA
MUNICIPIO DE TOA ALTA
MUNICIPIO DE NARANJITO
DAJAOS
Dajaos
Rio
(Joins sheet 17)
(Joins sheet 25)
LaB
DaD
LaC2
NaE2
Uv
MxD
MxE
RoC2
HtE
MxF
CbF
NaF2
CaF
Re
167
829
827
812


MINILLAS
GUARAGUAO ABAJO
GUARAGUAO ARRIBA
SANTA OLAYA
Cerro de Vergara
MUNICIPIO DE BAYAMÓN
MUN DE BAYAMÓN
CANTERA
Quebrada
Burgos
Olaya
Cs
AaC
MxE
MxF
MxD
NaF2
NaE2
NaD2
HtE
HtF
DaD
To
MaC
(Joins sheet 19)

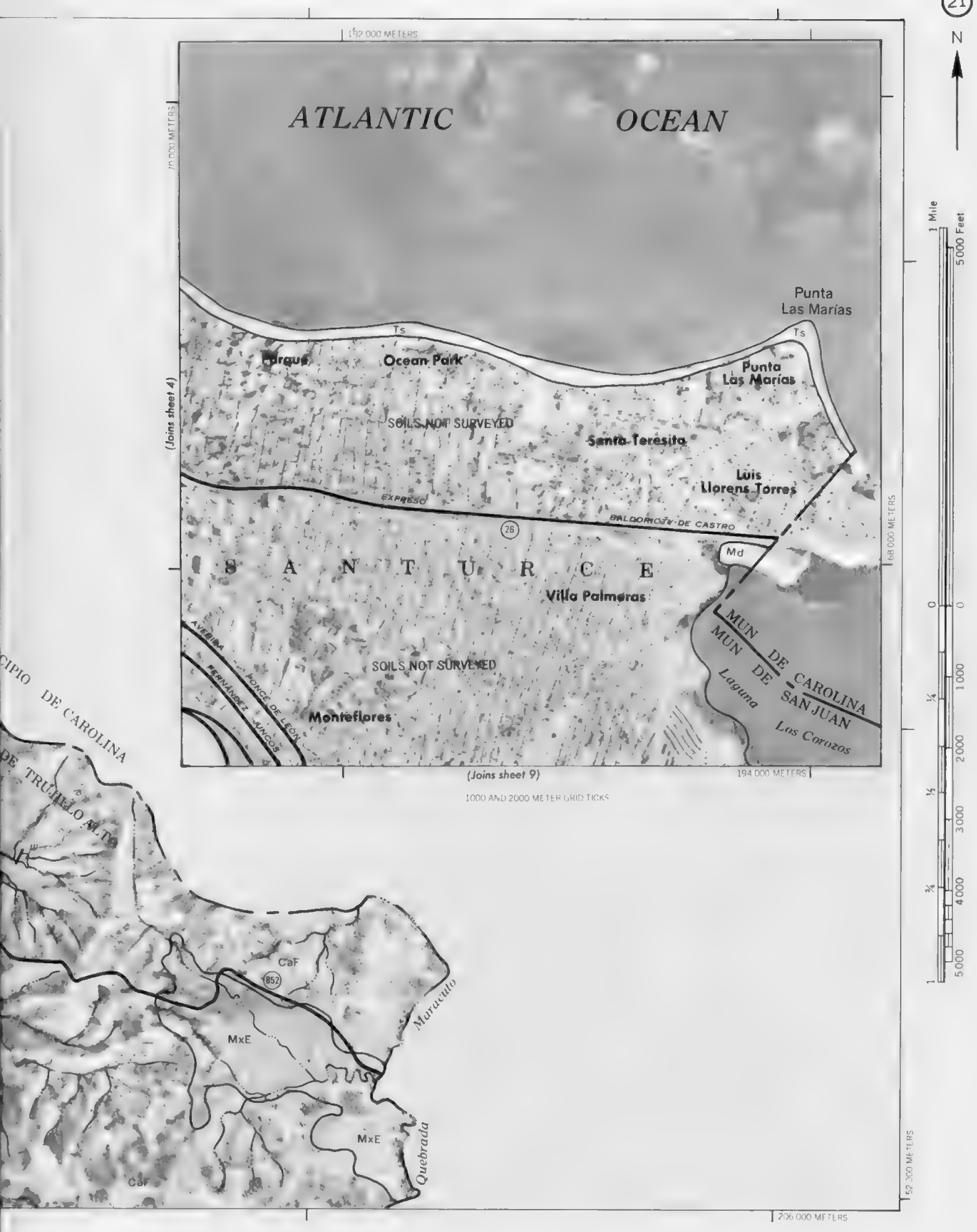

SANTA ROSA
CAMARONES
GUARAGUAO
MAMEY
HATO
Canto Gallo
El Laberinto
Cerro
Mague
Guaynabo
Río Bayamón
Río
Quebrada Limones
(Joins sheet 18)
833
837
836
835
834
174
70
1
MxF
MxE
MxD
HtE
HtF
NaF2
NaE2
NaD2
DaD
RpE2
RpF2
YeF
AaC
AaB
To
w


(Joins sheet 13)
(Joins sheet 20)
(Joins sheet 26)
19
N
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
Cerro Magueyes
TORTUGO
Beverly Hills
La Mirda
MUNICIPIO DE GUAYNABO
MUNICIPIO DE SAN JUAN
CAIMITO
RIO
QUEBRADA ARENAS
CANTERA
El Laberinto
Guaynabo
Rio
To
Arena
Quebrada
La Bayamonesa
ATO NUEVO
MxF
NaF2
NaE2
NaD2
HtF
HtE
HtE
SaF
CaF
CuF
AaC
DaD
842
834
173
797
1


20
N
(Joins sheet 14)
(Joins sheet 19)
(Joins sheet 27)
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
Quebrada
Las Curias
Alijibe Las Curias
Tanque de Agua
Carraizo Alto
MUNICIPIO DE SAN JUAN
MUNICIPIO DE TRUJILLO ALTO
CAIMITO
JUPEY
CARR
MUNICIPIO DE CAGUAS
MUNICIPIO DE SAN JUAN
SAN ANTONIO
Arena
HtE
HtF
DaD
JuD
MxE
MxF
MxD
NaF2
NaE2
RoC2
AaC
Alm
176
844
843
842
175


LA GLORIA
CARRAIZO
LAGO
QUEBRADA NEGRITO
QUEBRADA INFIERNO
JAGUAS
MUN DE TRUJILLO ALTO
MUN DE GURABO
LOIZA
RIO GRANDE DE LOIZA
Carraizo Alto
Quebrada Colorada
Quebrada Dimmes
Quebrada Collores
Quebrada
CANTERA
GRAVERO
(Joins sheet 21)
MxE
MxF
MxD
CaF
CaE
MaC
NaE2
NaD2
HuF
AaC
DaD
HtE
RoC2
To
Re


(Joins inset, sheet 37)
200 000 METERS
DOS BOCAS
LA GLORIA
Quebrada Infierno
Quebrada
Naranjo
Quebrada
QUEBRADA NEGRITO
QUEBRADA GRANDE
QUEBRADA INFIERNO
MUNICIPIO DE TRUJILLO ALTO
MUNICIPIO DE GURABO
MUNICIPIO DE CAROL
MUNICIPIO DE TRUJILLO ALT
Ramón Colón
Um
Grande
La Silla
CaF
CaE
MxE
NaD2
NaE2
JuD
AaC
(Joins sheet 20)
(Joins sheet 28)

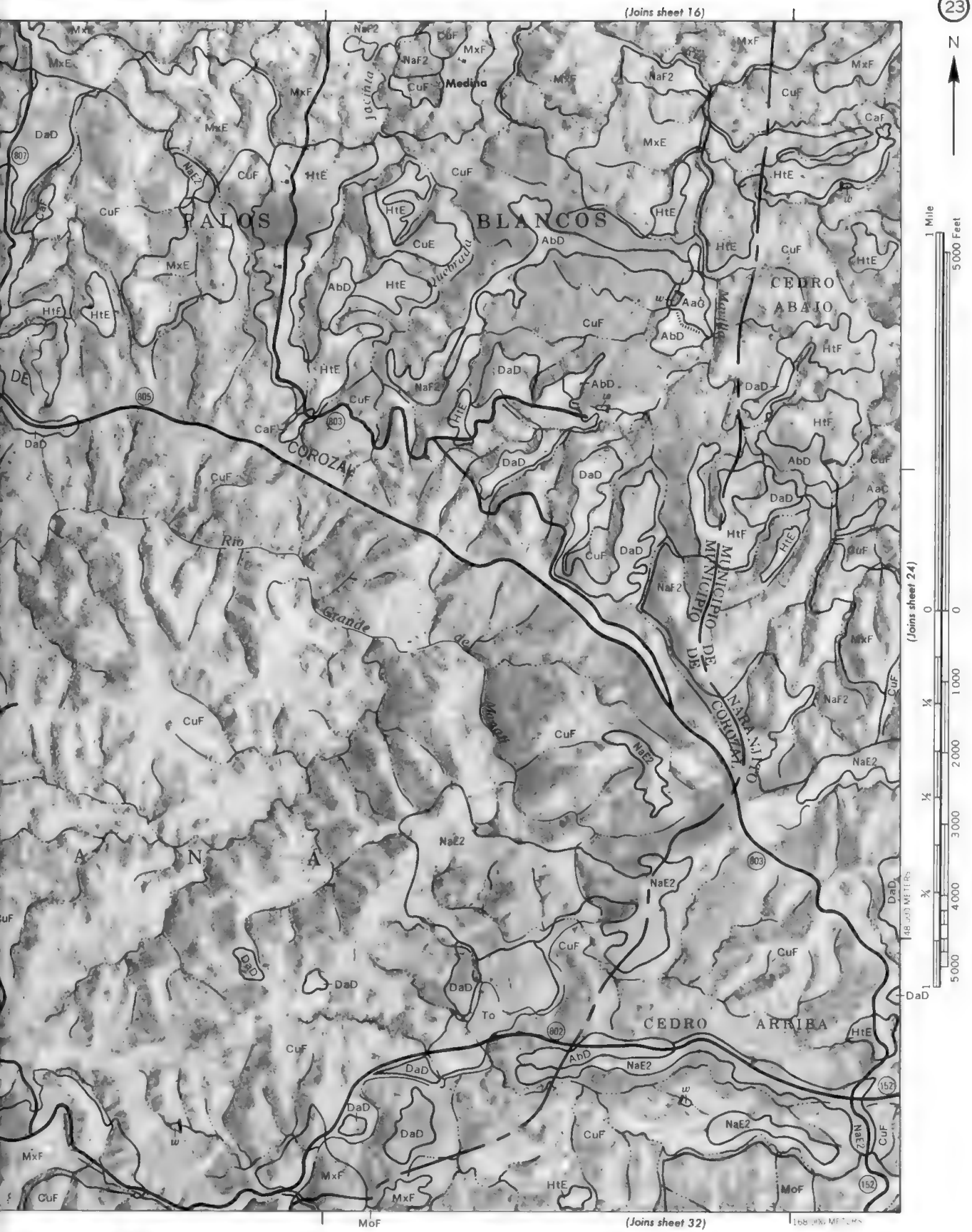

192 000 METERS
ATLANTIC OCEAN
Punta Las Marías
Ts
Ocean Park
SOILS NOT SURVEYED
Santa Teresita
Luis Llorens Torres
EXPRESO
BALDORIOTY DE CASTRO
26
Md
S A N T U R C E
Villa Palmeras
AVENIDA FERNANDEZ JUNCOS
PONCE DE LEON
SOILS NOT SURVEYED
Monteflores
MUN DE CAROLINA
MUN DE SAN JUAN
Laguna
Los Corozos
(Joins sheet 4)
(Joins sheet 9)
194 000 METERS
68 000 METERS
52 000 METERS
206 000 METERS
1000 AND 2000 METER GRID TICKS
CIPIO DE CAROLINA
DE TRUJILLO ALTO
CaF
852
MxE
Maraculo
MxE
Quebrada
CaF
21
N
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000

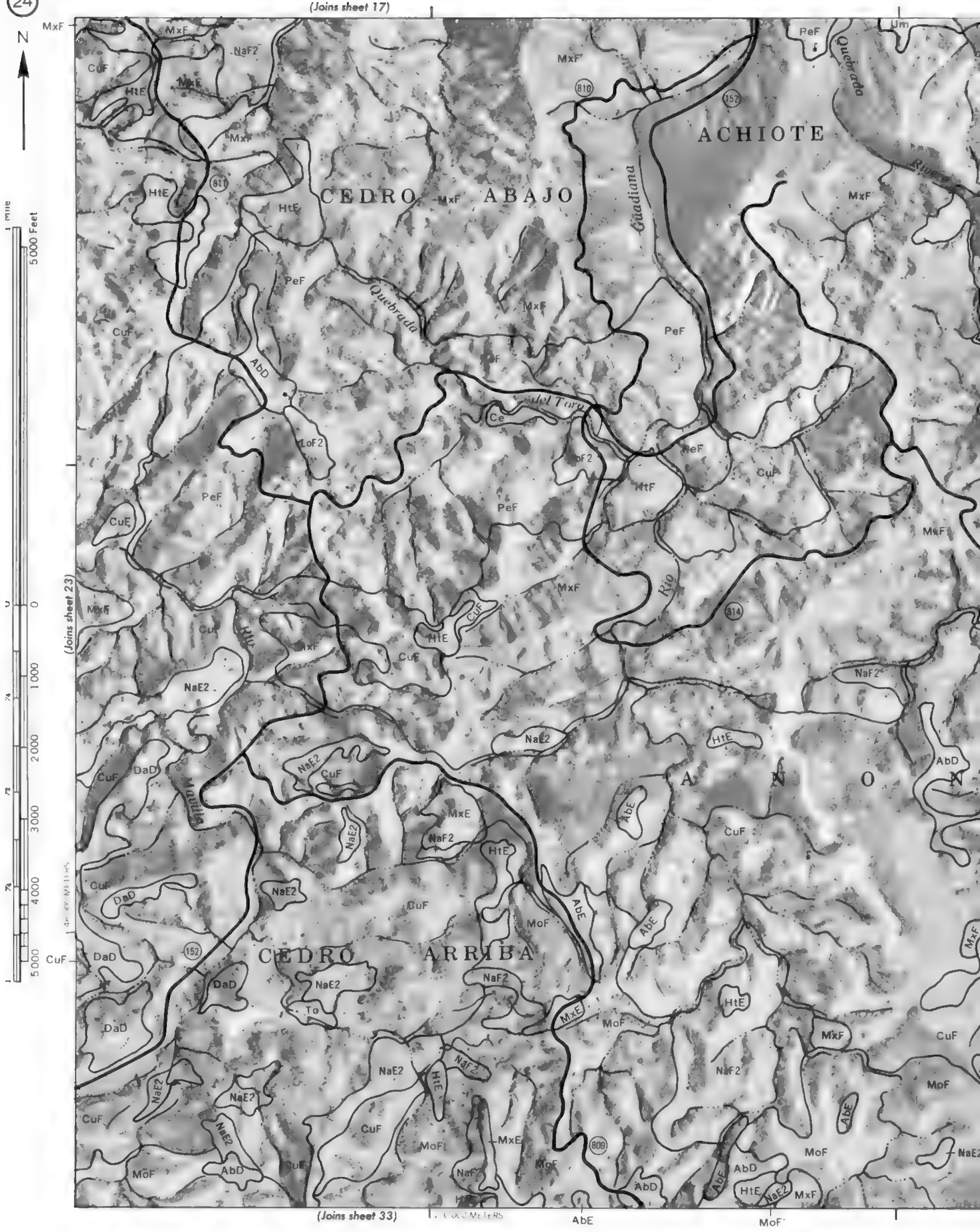
(22)


N
1 Mile
5000 Feet
0
¼
½
¾
1
0
1000
2000
3000
4000
5000
(Joins inset, sheet 29)
MUNICIPIO DE MOROVIS
MUNICIPIO DE OROCOVIS
G A T O
BARROS
Quebrada
Rio
Santo
Muerto
Cabrasa
155
MxF
MoF
CuF
DaD
CbF
HtE
MuF2
MxE
CuB
NaF2


(Joins sheet 15)
(Joins sheet 23)
CUCHILLAS
MAGUEYES
MATA DE CAÑAS
PALMARITO
COROZAL
MUNICIPIO DE
Rio Grande de Manati
Quebrada Grande
Rio Orocovis
Cerro Magueyes
CuF
CuE
CaF
DaD
Es
HtE
HtF
MoF
MxE
MxF
NaF2
618
568

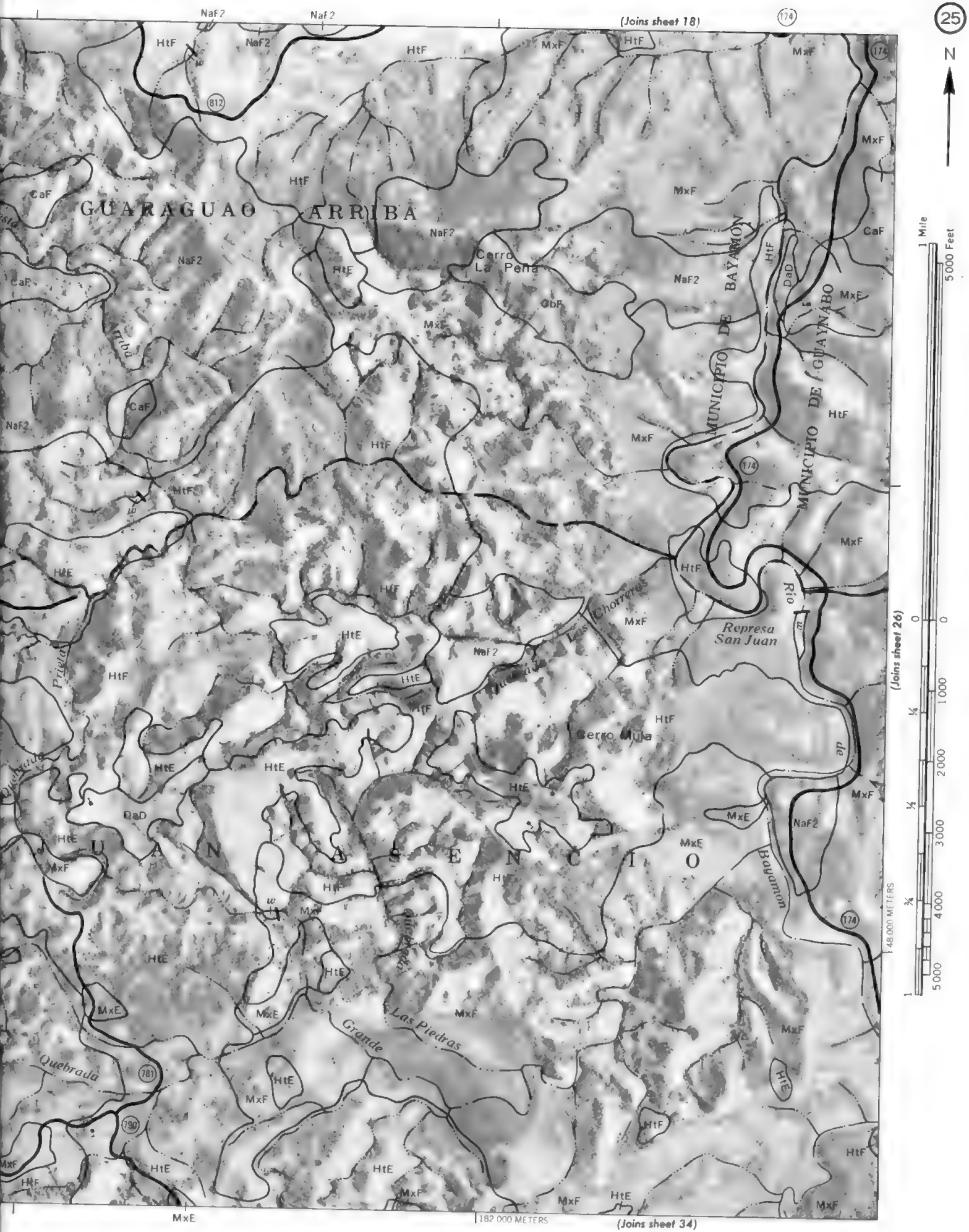

CUCHILLAS
DE
MONTAÑAS
NORTE
RAIMARITO
Río Grande de Manatí
Quebrada
Riachuelo
Berio
Uv
To
Es
Fo
AaC
AbE
CaF
CbF
CuE
CuF
DaD
HtE
HtF
MoF
MxE
MxF
NaF2
NeE2
568
807
805
800
771
7771
(Joins sheet 22)

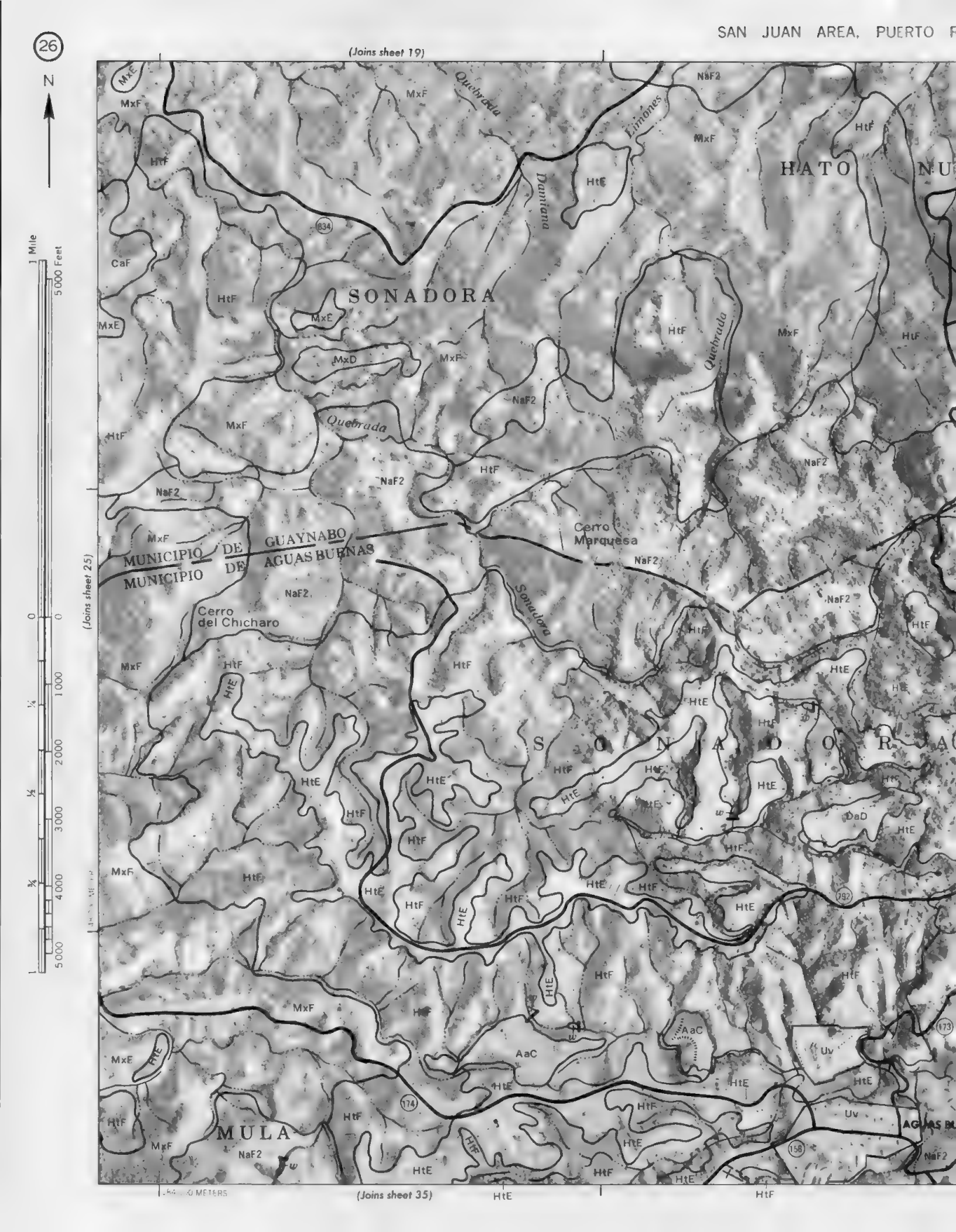

(Joins sheet 16)
23
N
PALOS BLANCOS
CEDRO ABAJO
CEDRO ARRIBA
COROZAL
MUNICIPIO DE COROZAL
NARANJITO
Medina
Jacinta
Quebrada
Mamey
Rio Grande de Manati
1 Mile
5000 Feet
(Joins sheet 24)
(Joins sheet 32)
MxE
MxF
NaF2
CuF
HtE
HtF
AbD
DaD
CaF
AaC
NaE2
MoF
To
803
805
807
802
152


(Joins sheet 17)
(Joins sheet 23)
(Joins sheet 33)
N
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
CEDRO ABAJO
ACHIOTE
CEDRO ARRIBA
A N O N
Quebrada
Guadiana
del Toro
Río
Maulle
810
152
811
814
809
MxF
CuF
NaF2
HtE
PeF
AbD
LoF2
Ce
CuE
NaE2
DaD
MxE
MoF
AbE
To
Um
HtF
AbE
MoF

PUERTO RICO — SHEET NUMBER 24

(Joins sheet 24)

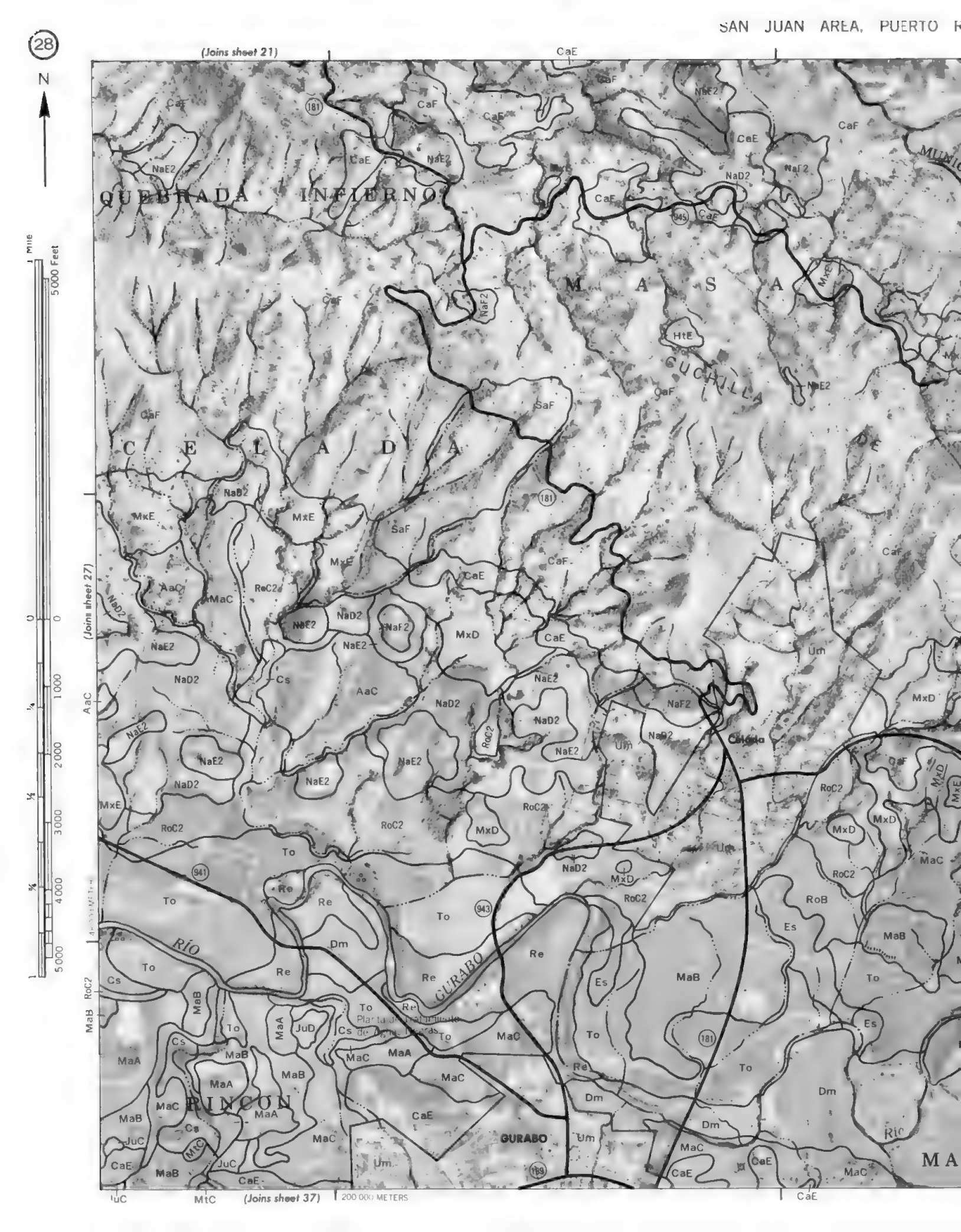

(Joins sheet 18)
25
N
GUARAGUAO ARRIBA
Cerro La Peña
MUNICIPIO DE BAYAMON
MUNICIPIO DE GUAYNABO
Represa San Juan
Las Chorreras
Cerro Mula
Las Piedras
Grande
Quebrada
Rio de Bayamon
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
48 000 METERS
182 000 METERS
(Joins sheet 26)
(Joins sheet 34)
HtF
HtE
MxF
MxE
NaF2
CaF
DaD
ObF


26
N
1 Mile
5000 Feet
(Joins sheet 19)
(Joins sheet 25)
(Joins sheet 35)
Quebrada
Limones
Damiana
Quebrada
Quebrada
Sonadora
HATO
SONADORA
MUNICIPIO DE GUAYNABO
MUNICIPIO DE AGUAS BUENAS
Cerro Marquesa
Cerro del Chicharo
MULA
MxF
MxE
MxD
HtF
HtE
NaF2
CaF
DaD
AaC
Uv
834
174
173
158


NUEVO
MUN DE SAN JUAN
JAGUEYES
RIO CAÑAS
BAIROA
AGUAS BUENAS
MUNICIPIO DE CAGUAS
MUNICIPIO DE
Río Bairoa
Cuyas
Las Carolinas
(Joins sheet 27)
NaF2
NaE2
DaD
AaC
HtF
HtE
CaF
CbF
CuF
MxF
MxE
VkC2
173
797
795
156


SAN ANTONIO
RIO CAÑAS
BAIROA
La Charca
Quebrada Arena
Río
Cañas
LAGO LOÍZA
La Barra
Altos de la Meseta
Altos
Río Bairoa
Las Carolinas
(Joins sheet 26)
AaC
DaD
HtF
HtE
NaF2
NaE2
NaD2
Um
MxE
MxF
MxD
MtC
MtB
MaB
CaF
VkC2
JuC
Es
Uv
RoC2
175
795
796
52
30

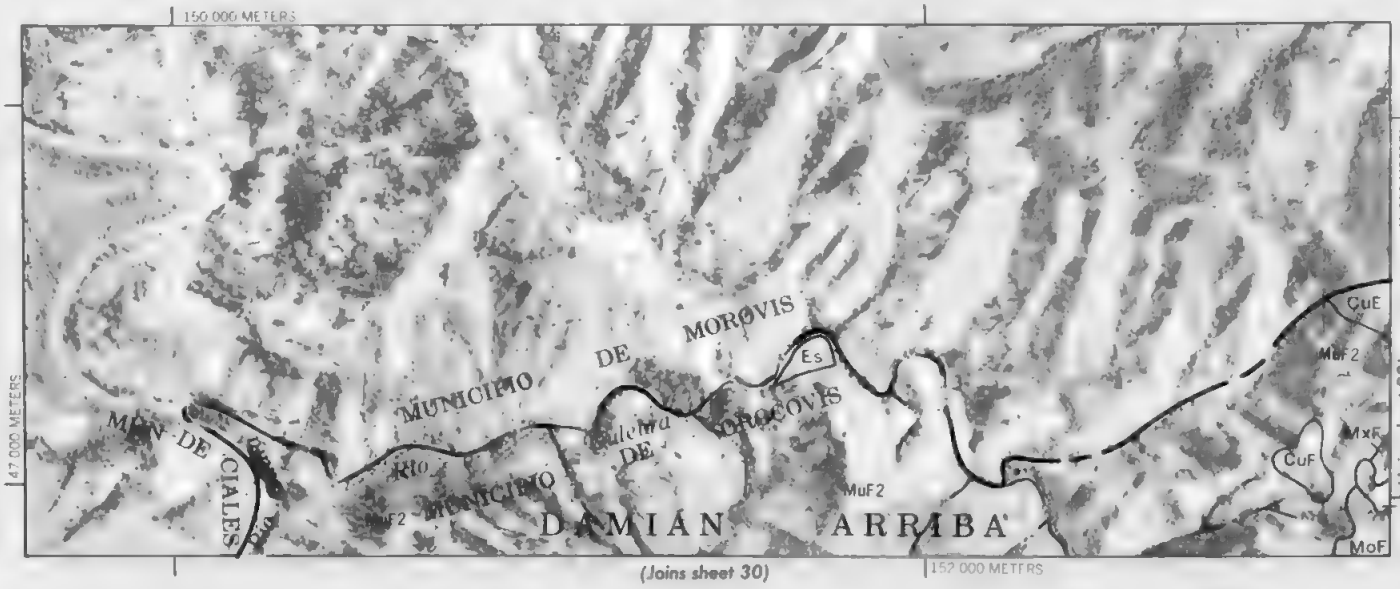

(Joins sheet 20)
(Joins sheet 28)
(Joins sheet 36)
N
1 Mile
5000 Feet
QUEBRADA INFIERNO
LAGO LOIZA
J A G U A S
CELADA
RINCÓN
RIO GRANDE DE LOIZA
GRAVERO
RIO GURABO
GURABO
Rio Bairoa
Rio Caguitas
MUNICIPIO DE CAGUAS
MUNICIPIO DE GURABO
de San Luis
941
30
MxF
MxE
MxD
CaF
NaF2
NaE2
NaD2
SaF
AaC
AaB
Aab
HtE
RoC2
MaC
MaB
MaA
CaE
JuD
JuC
Re
To
Cs
Es
CbF
MtB
RoB
w


28
N
(Joins sheet 21)
(Joins sheet 27)
(Joins sheet 37)
QUEBRADA INFIERNO
M A S A
C E L A D A
CUCHILLA
RÍO GURABO
RINCON
GURABO
Canóvanas
Río
CaE
CaF
NaE2
NaD2
NaF2
MxE
MxD
HtE
SaF
AaC
MaC
RoC2
Cs
NaD2
MaB
MaA
JuD
JuC
MtC
To
Re
Dm
Es
RoB
Um
941
943
945
181
189
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
200 000 METERS

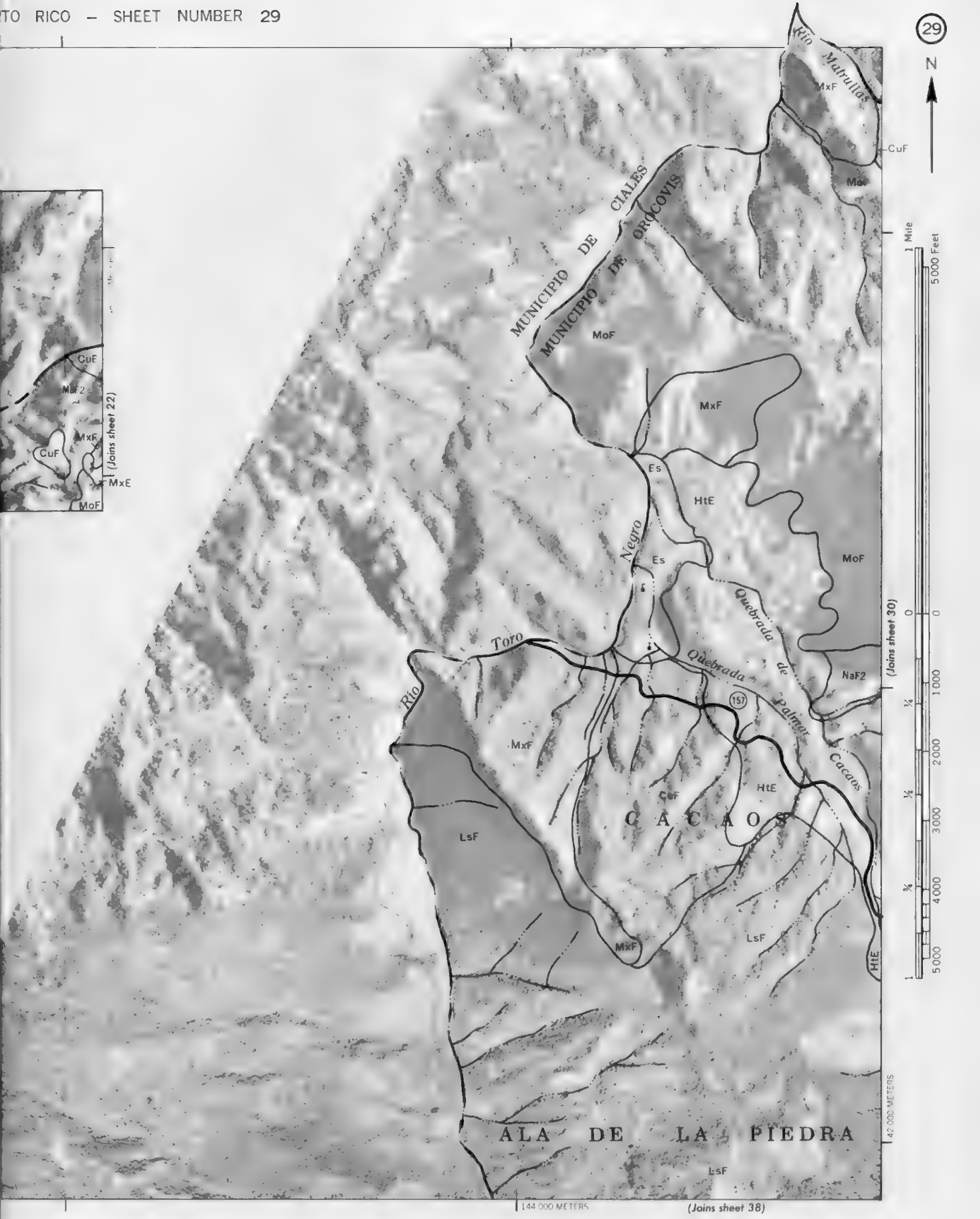

MUNICIPIO DE TRUJILLO ALTO
Quebrada
Maracuto
MUNICIPIO DE CAROLINA
MUNICIPIO DE GURABO
HATO NUEVO
HATO NUEVO
MUNICIPIO DE JUNCOS
MAMEY
Gurabo
María Jiménez
944
CaF
NaE2
MxE
MxD
CaE
HtE
Um
MaC
RoB
RoC2
JuC
JuD
VkC2
To
Re
Es
Om
NaF2

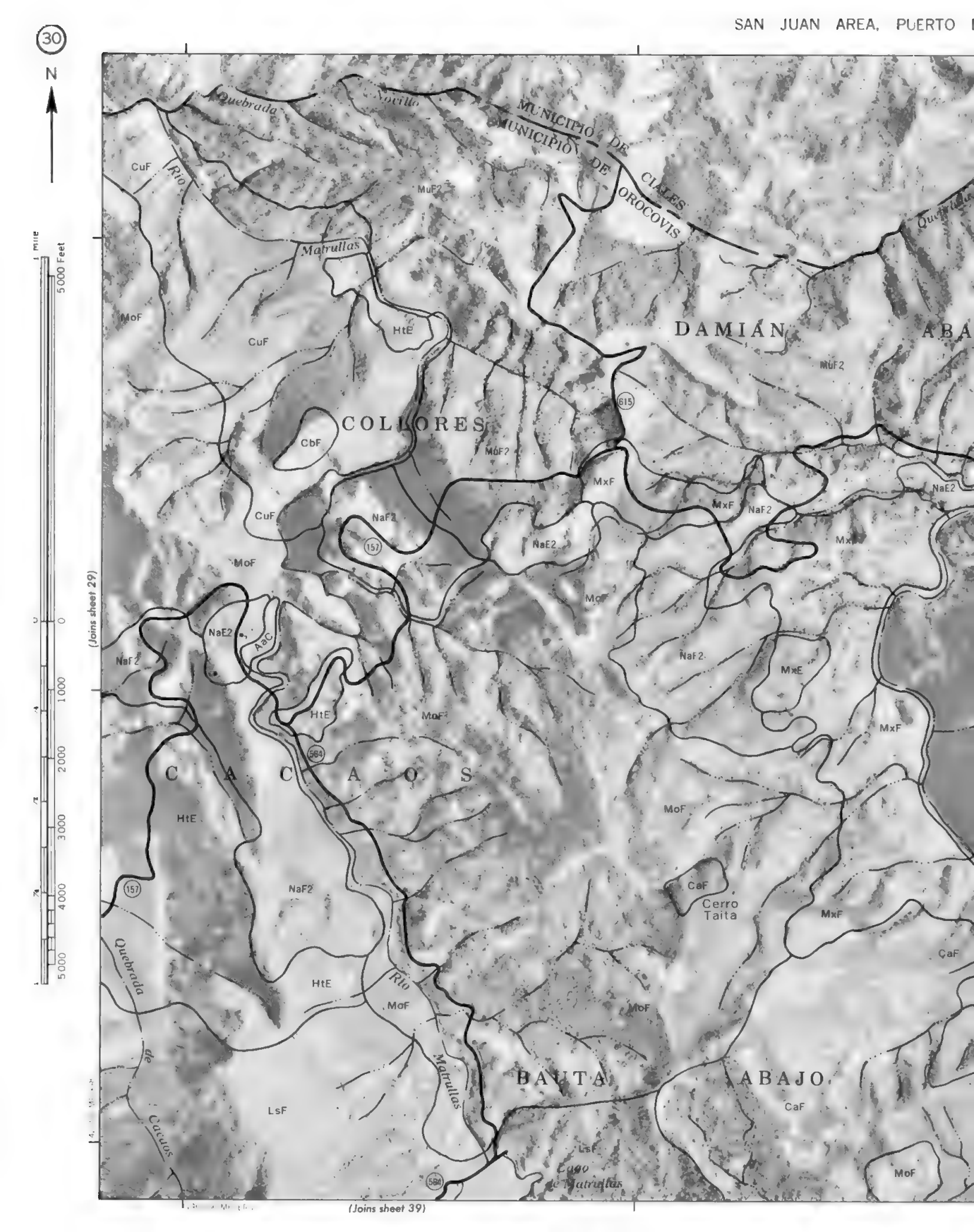
140 000 METERS

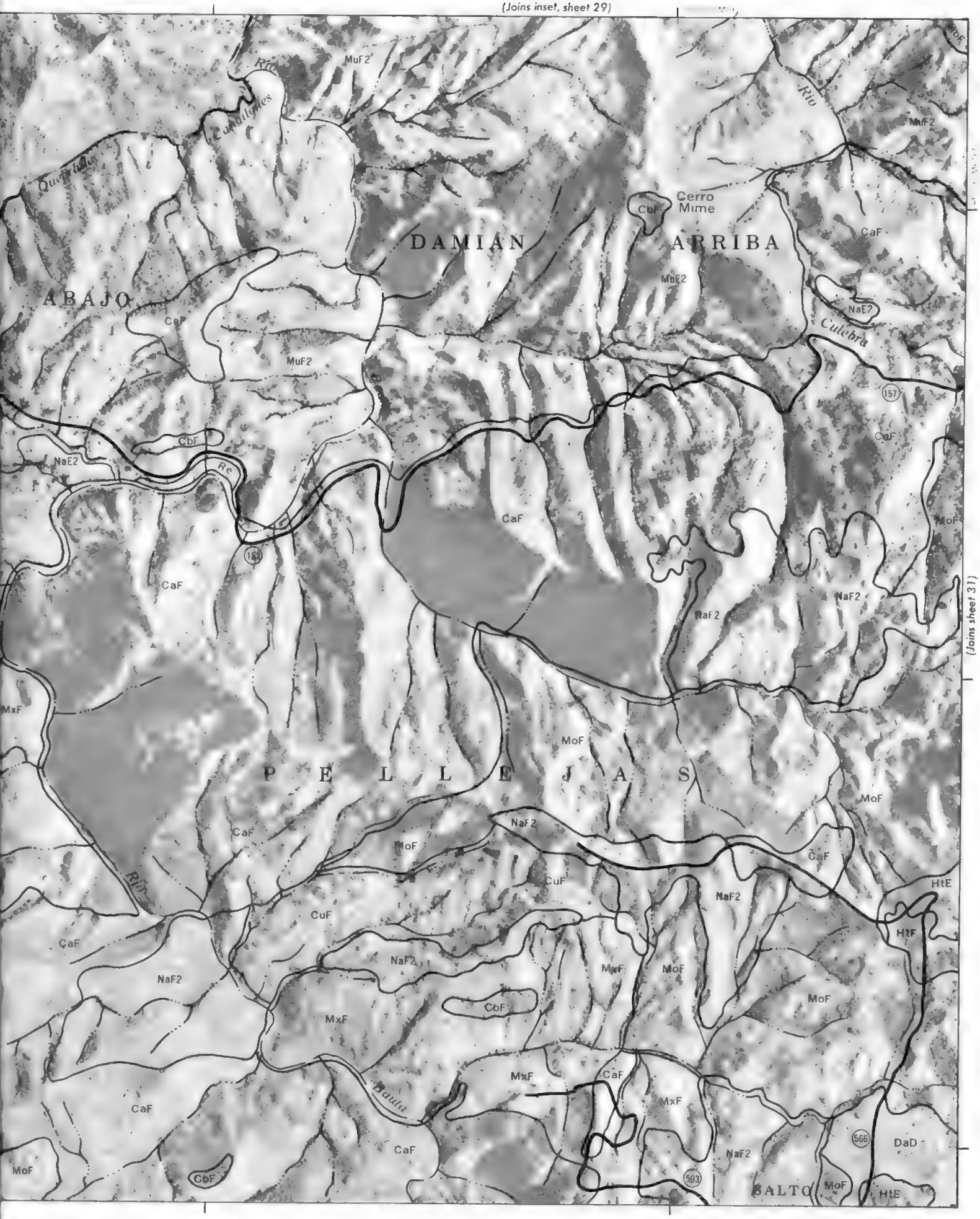
46 000 METERS



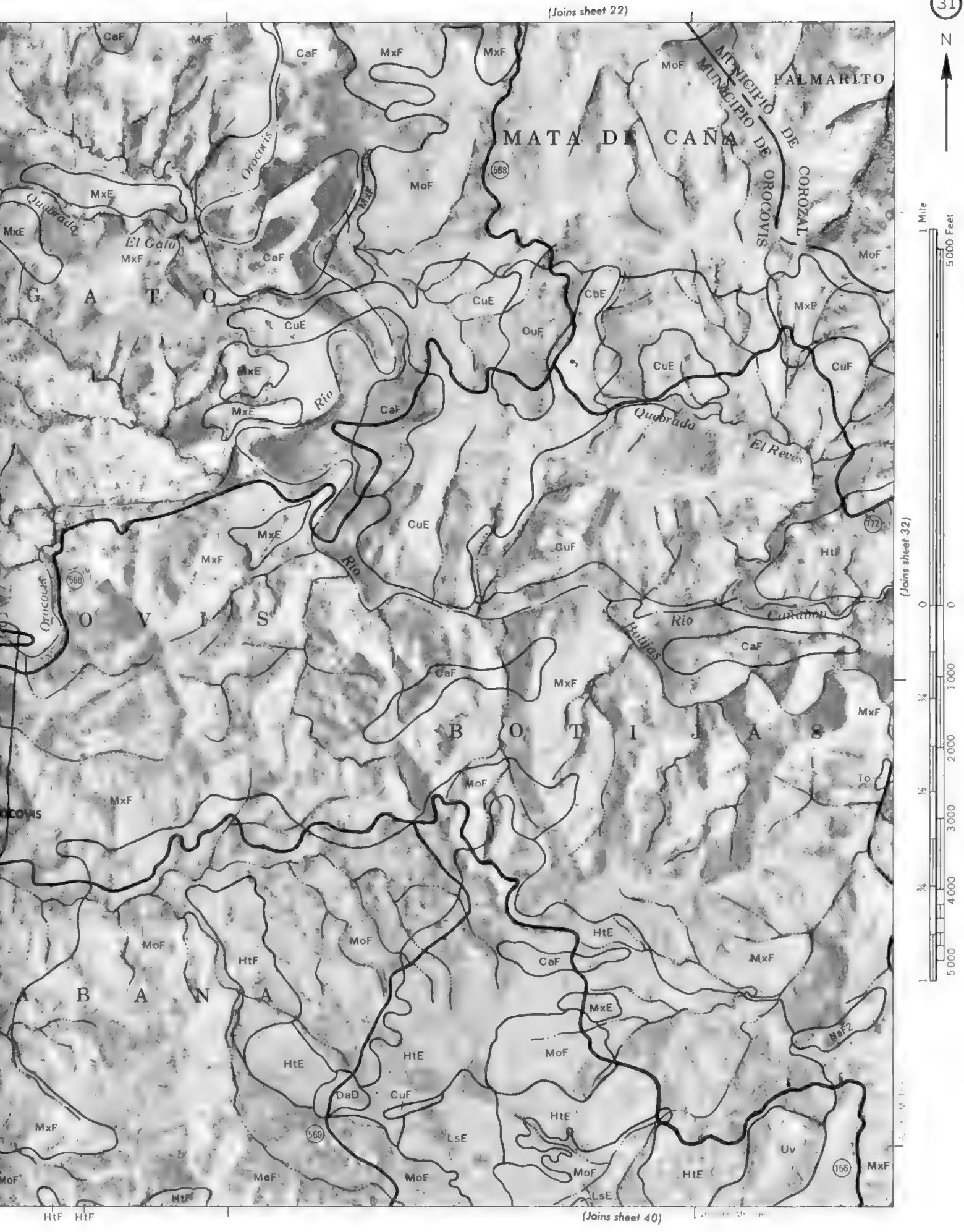
1000 AND 2000 METER GRID TICKS

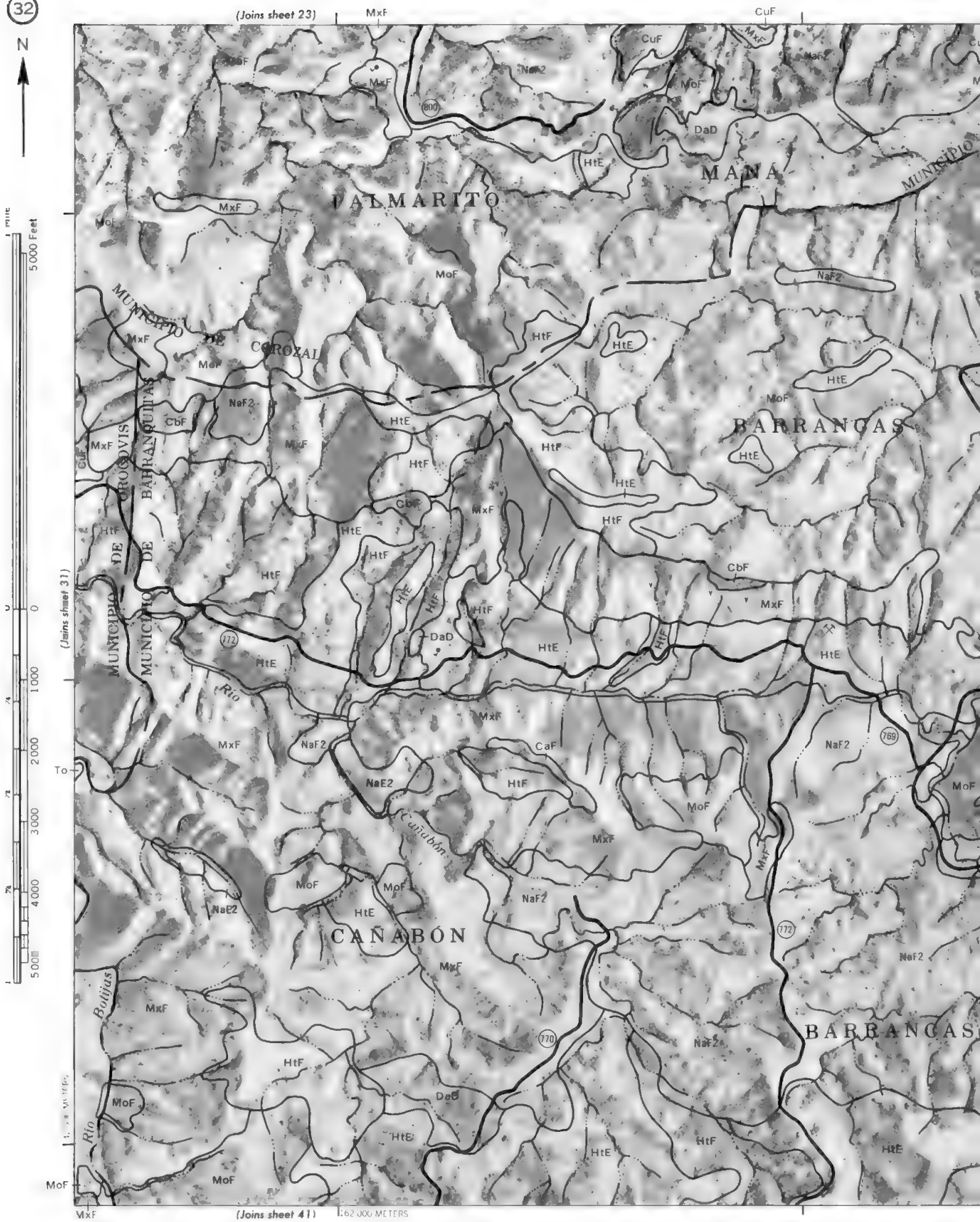

29
N
Río Matrullas
MxF
CuF
MoF
MUNICIPIO DE CIALES
MUNICIPIO DE OROCOVIS
MxF
Es
HtE
Río Negro
Es
MoF
Quebrada de Palmar
Río Toro
Quebrada de Cacaos
NaF2
157
MxF
CuF
HtE
CACAOS
LsF
MxF
LsF
HtE
ALA DE LA PIEDRA
LsF
1 Mile
5000 Feet
0
0
(Joins sheet 30)
1000
¼
2000
½
3000
¾
4000
1
5000
42 000 METERS
144 000 METERS
(Joins sheet 38)
CuE
MaF2
MxF
CuF
MxE
MoF
(Joins sheet 22)


30
N
1 Mile
5000 Feet
5000
4000
3000
2000
1000
0
Quebrada Novillo
MUNICIPIO DE CIALES
MUNICIPIO DE OROCOVIS
Río Matrullas
DAMIÁN ABA
COLLORES
C A C A O S
BAUTA ABAJO
Cerro Taita
Quebrada de Cacaos
Río Matrullas
Lago de Matrullas
CuF
MuF2
MoF
HtE
CbF
MxF
NaF2
NaE2
AaC
LsF
CaF
(Joins sheet 29)
(Joins sheet 39)


(Joins inset, sheet 29)
DAMIAN ABAJO
DAMIAN ARRIBA
Cerro Mime
Río Cañitas
Quebrada
Río
Culebra
PELLEJAS
Río
Bauta
SALTO
MuF2
CaF
CbF
NaE2
NaF2
MoF
MxF
CuF
HtE
DaD
157
184
503
566
(Joins sheet 31)


DAMIAN ARRIBA
BARROS
OROCOVIS
S A L T O S
O R O C
Cerro Pio
Quebrada Damian
Rio Sana Muerto
Sana Muerto
Barros
Los Saltos
Orocovis
Quebrada
Rio
(Joins sheet 30)
MoF
MxF
MxE
MuF2
CaF
CbF
HtE
HtF
NaF2
DaD
CuE
AaC
Um
155
157
158
DaD
NaF 2
HtF

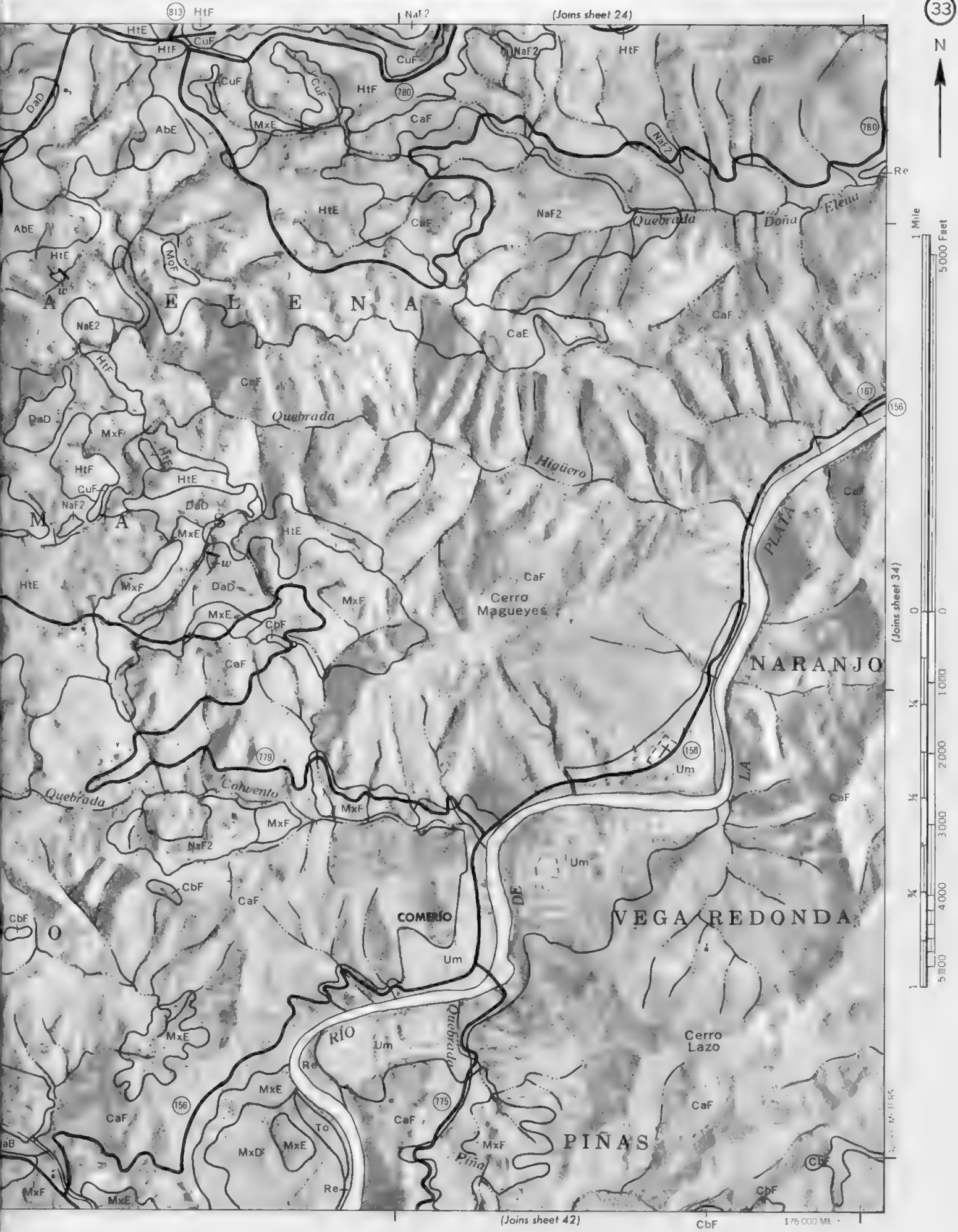

(Joins sheet 22)
MUNICIPIO DE OROCOVIS
MUNICIPIO DE COROZAL
PALMARITO
MATA DE CAÑA
G A T O
O V I S
B O T I J A S
A B A N A
Orocovis
Quebrada
El Gato
Río
Quebrada
El Reves
Río
Cuabón
Botijas
Río
(568)
(569)
(172)
(156)
CaF
MxF
MoF
CuE
CbE
OuF
CuF
HtF
HtE
DaD
LsE
Uv
(Joins sheet 32)
(Joins sheet 40)
31
N
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000

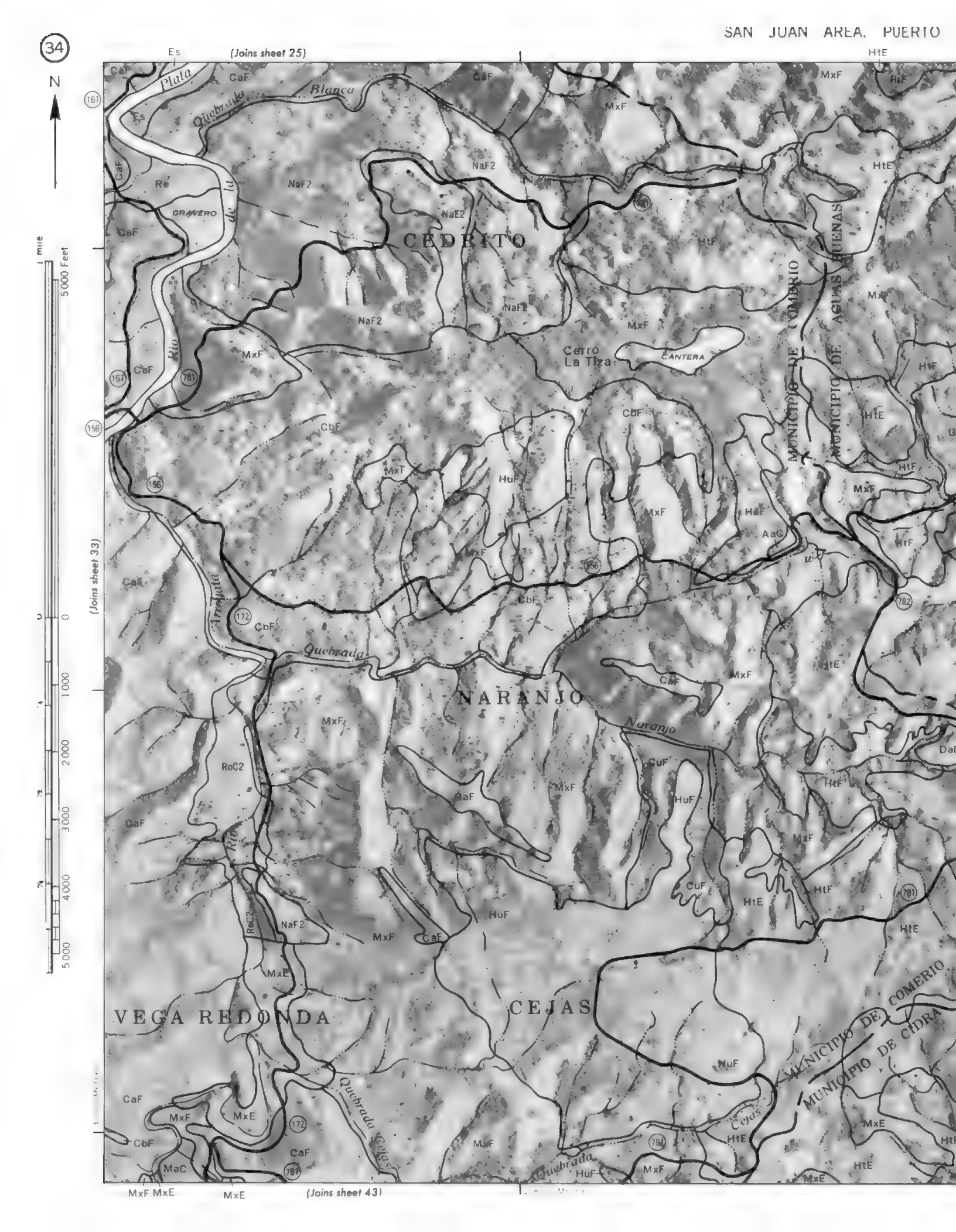

N
(Joins sheet 23)
(Joins sheet 31)
(Joins sheet 41)
5000 Feet
0
1000
2000
3000
4000
5000 Meters
MUNICIPIO DE COROZAL
MUNICIPIO DE BARRANQUITAS
MUNICIPIO
VALMARITO
MANA
BARRANCAS
CAÑABON
Río Bolitas
Río Cañabón
MxF
MoF
HtE
HtF
NaF2
CbF
CuF
DaD
CaF
NaE2
800
772
769
770


MUNICIPIO DE COROZAL
CEDRO ARRIBA
MUNICIPIO DE NARANJITO
MUNICIPIO DE BARRANQUITAS
Manatí
Cerro Farallón
Río Grande
Río
Barrancas
JUAN GONZALEZ
QUEBRADILLAS
MONTAÑAS DE
Caliente
ANGAS
CuF
MxF
MoF
HtE
HtF
CIC
DaC
DaD
NaF2
NaE2
(Joins sheet 33)


CEDRO ARRIBA
MUNICIPIO DE NARANJITO
MUNICIPIO DE COMERÍO
DONALO
PALOMAS
QUEBRADILLAS
MUNICIPIO DE BARRANQUITAS
MUNICIPIO DE COMERÍO
RIO HONDO
QUEBRADA GRANDE
Quebrada Higuero
Río Grande
Río Hondo
Palomas
Río Hondo
Um
(Joins sheet 32)
MoF
AbD
AbE
HtE
HtF
MxF
NaE2
NaF2
DaC
DaD
CaF
CbF
MaB
MxD
MxE
CIC
Uv
Es
779
809
780
152
716
749

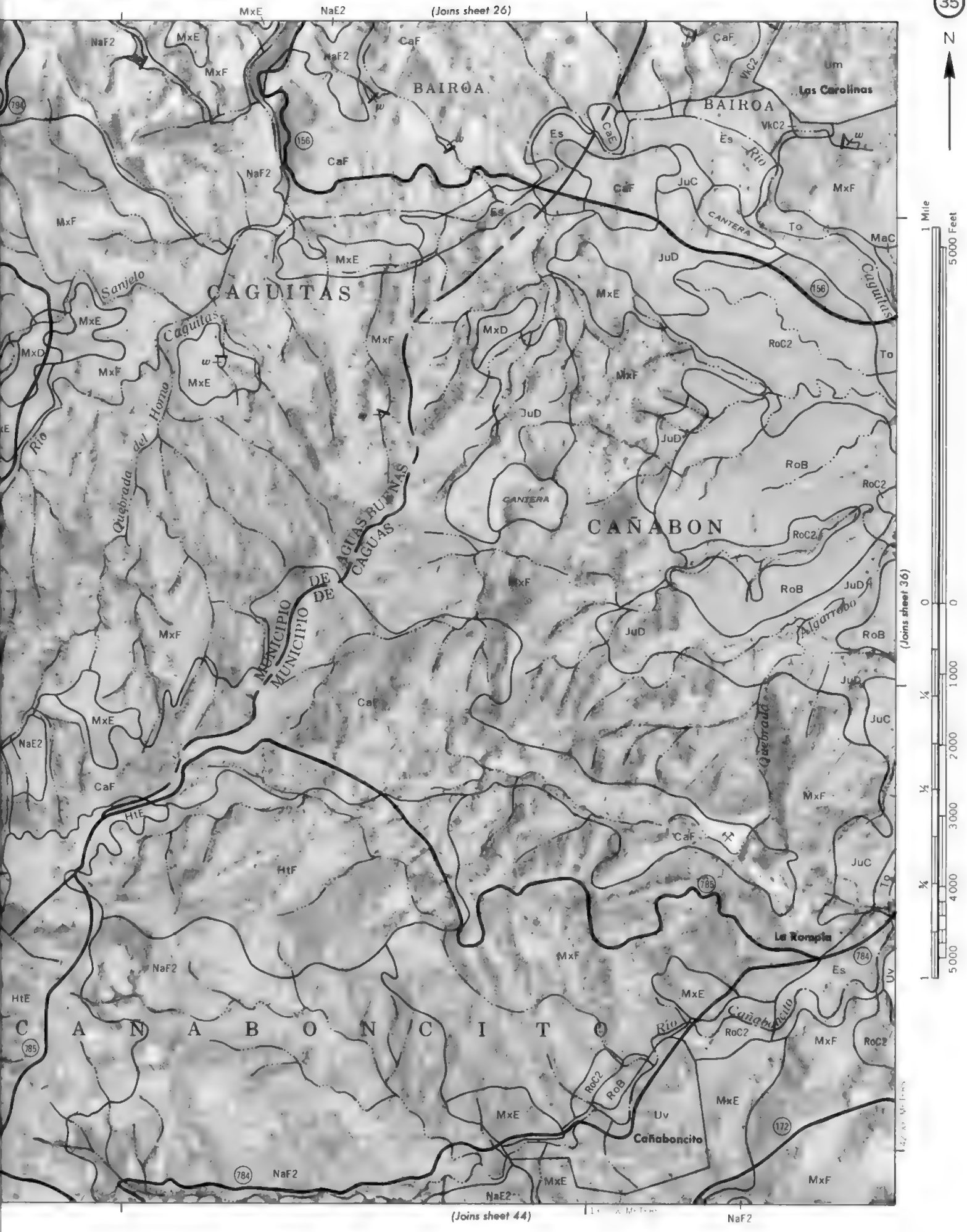
RICO — SHEET NUMBER 33



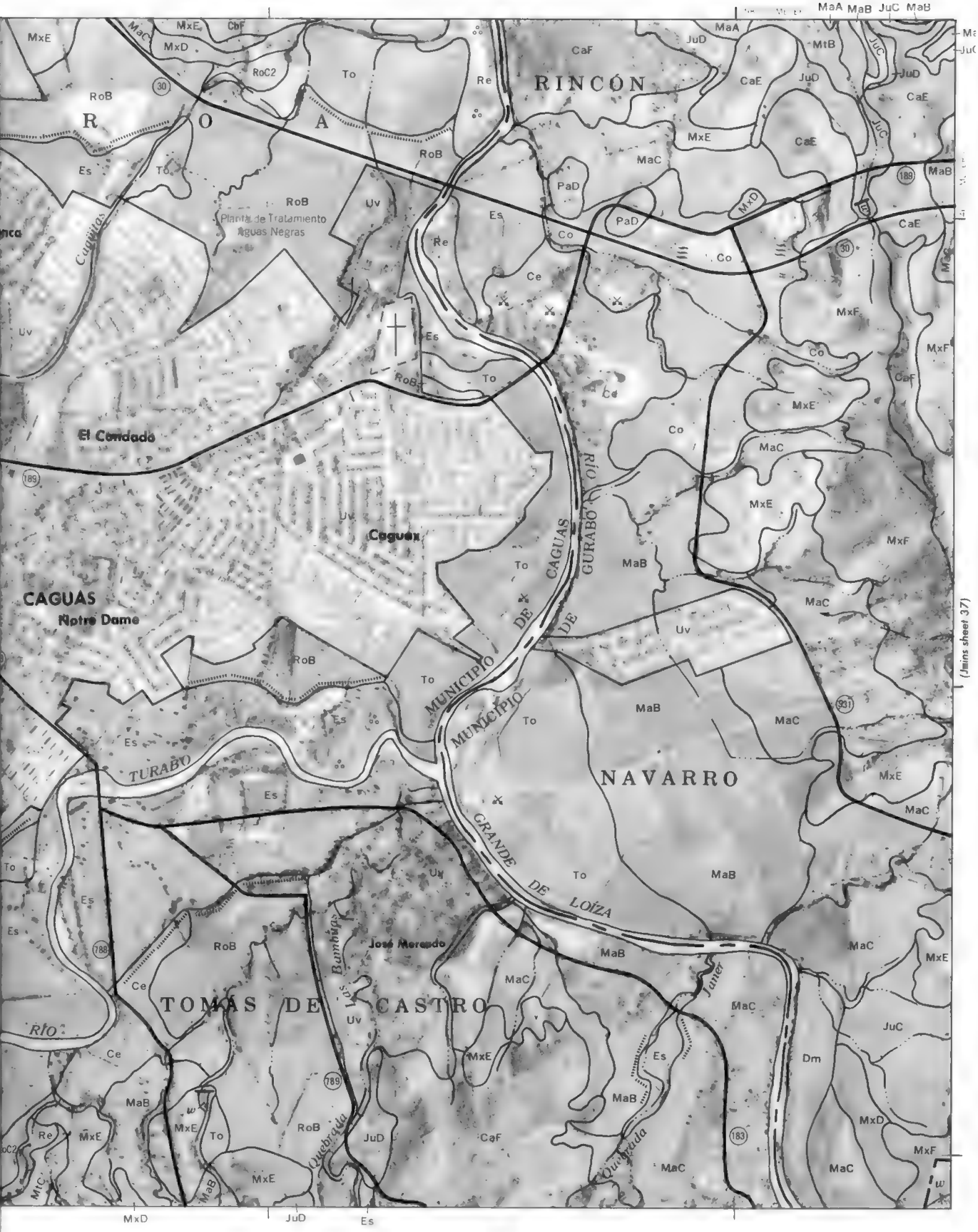

N
(Joins sheet 25)
(Joins sheet 33)
(Joins sheet 43)
CEDRITO
NARANJO
VEGA REDONDA
CEJAS
Cerro La Tiza
CANTERA
GRANERO
Río Plata
Quebrada Blanca
Río Arenata
Quebrada Naranjo
Quebrada Cejas
MUNICIPIO DE COMERIO
MUNICIPIO DE AGUAS BUENAS
MUNICIPIO DE CIDRA
CaF
NaF2
NaE2
MxF
MxE
HtF
HtE
HuF
CbF
RoC2
MaC
AaC
CuF
NuF
5000 Feet
1000
2000
3000
4000
5000

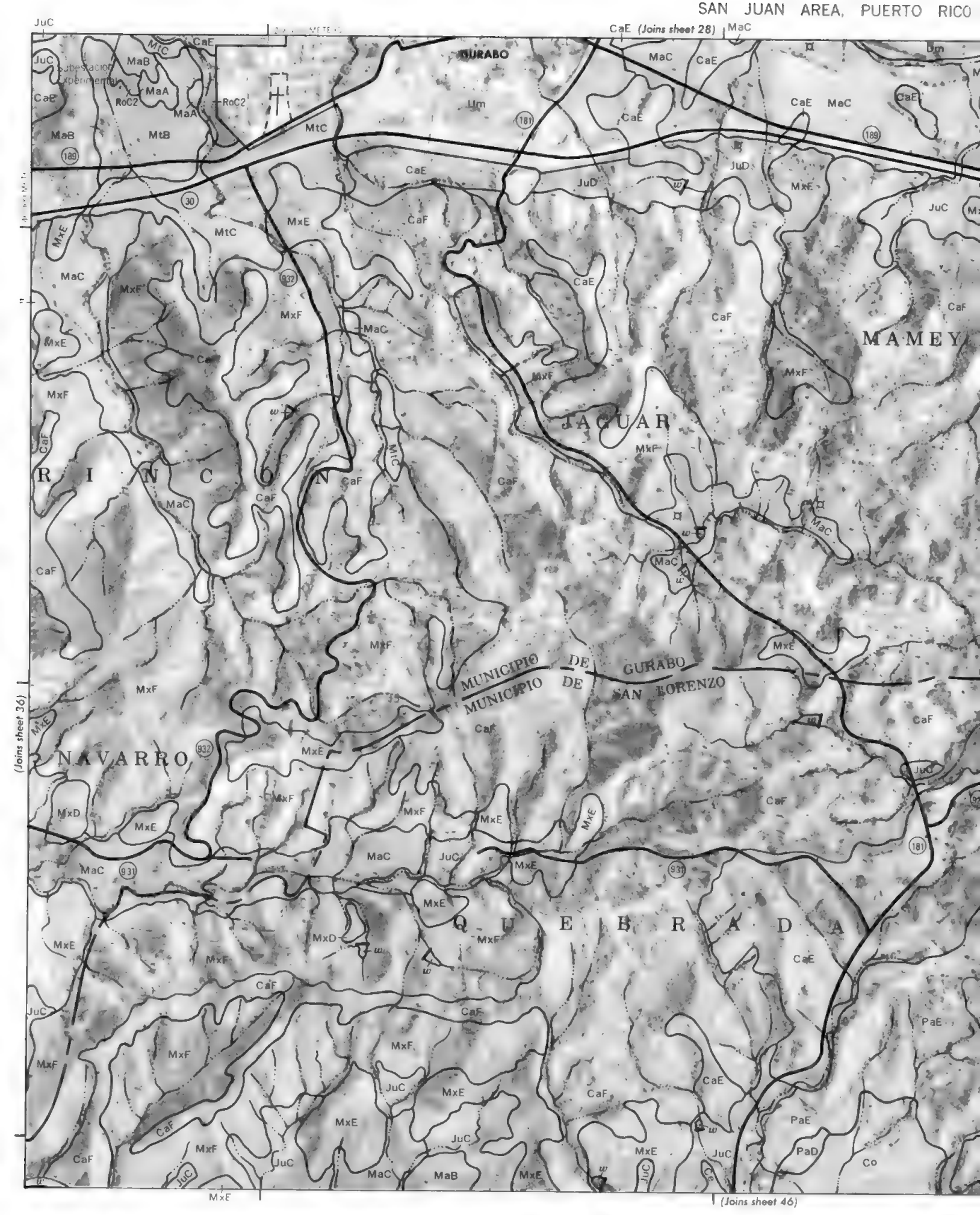

JUAN ASENCIO
MULITA
MULA
BAYAMONCITO
SUMIDERO
CEIBA
MONTE LLANO
Cerro Santa Bárbara
Quebrada
Quebrada Puerta Vieja
Río Bayamón
Río Bayamón de Cidra
MUNICIPIO DE AGUAS BUENAS
MUNICIPIO DE CIDRA
COMERIO
DE CIDRA
Ceiba
(Joins sheet 35)

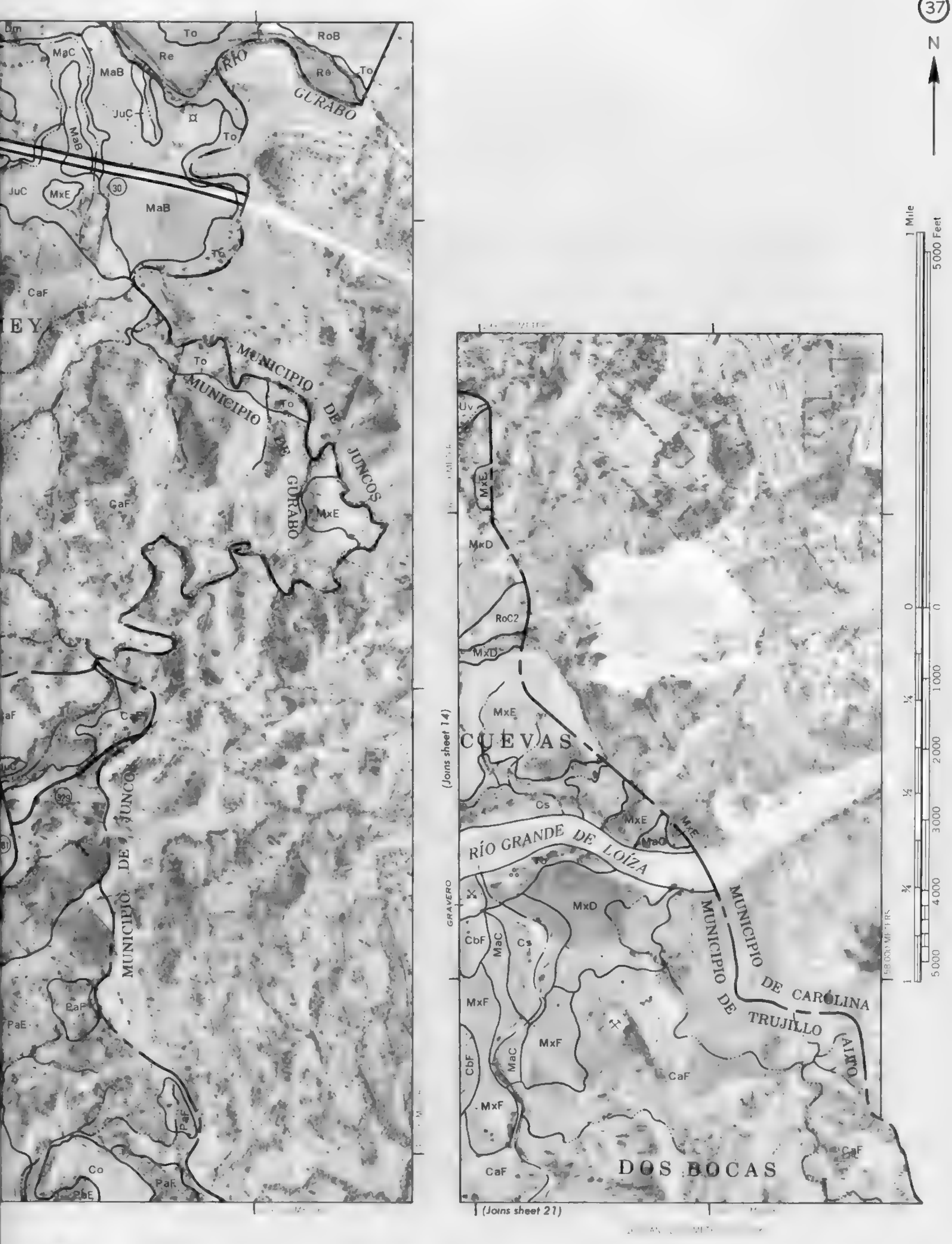

SUMIDERO
M U L A
SUMIDERO
Los Sumideros
Sumidero
Santa Clara
Um
MUN DE CIDRA
Quebrada
Quebrada
Yaucana
Río
(Joins sheet 34)
MxF
MxD
NaF2
HtE
HtF
MaC
AaC
DaD
TaF
MlF
AbE
CuF
NaE2
158
794
156
173
172
785

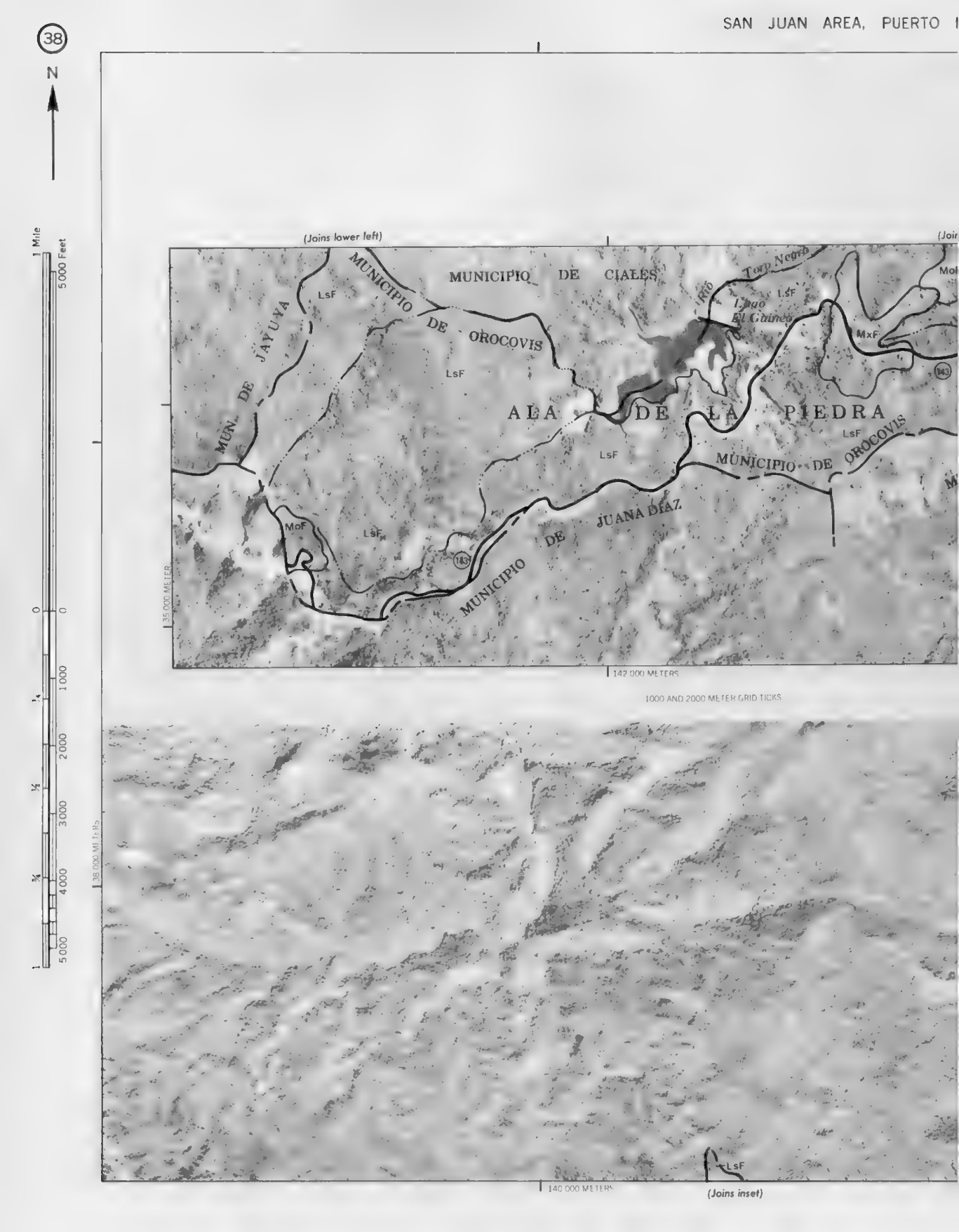

35
N
(Joins sheet 26)
(Joins sheet 36)
(Joins sheet 44)
BAIROA
BAIROA
CAGUITAS
CAÑABON
CANABONCITO
Las Carolinas
La Rompia
Cañaboncito
Caguitas
Sanjelo
Quebrada del Horno
Río
AGUAS BUENAS
DE CAGUAS
MUNICIPIO DE
MUNICIPIO DE
Algarrobo
Quebrada
Cañabonicito
Río
CANTERA
CANTERA
MxE
MxF
MxD
NaF2
NaE2
CaF
CaE
Es
JuC
JuD
RoB
RoC2
VkC2
Um
To
MaC
HtE
HtF
Uv
784
785
156
172
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000


N
Mile
5000 Feet
0
1000
2000
3000
4000
5000
(Joins sheet 27)
(Joins sheet 35)
(Joins sheet 45)
Los Carolinas
Um
MtB
JuC
MxF
CaF
MaC
MxE
MxF
RoB
C A Ñ A B Ó N
To
RoC2
Río
JuD
Cañaboncito
Caguitas
MaB
JuC
CAÑABONCITO
Uv
B A I R
Villa Blanca
Río
Morales
CAGUAS
El Verde
Turabo
Villa del Rey
T U R A B O
NaE2
MxF
Es
CaE
CaF
Re
RoC2
MaB
MxE
Uv


RINCÓN
CAGUAS
NAVARRO
TOMÁS DE CASTRO
El Comandó
Notre Dame
Caguax
Planta de Tratamiento Aguas Negras
MUNICIPIO DE CAGUAS
MUNICIPIO DE GURABO
MUNICIPIO DE LOÍZA
RÍO GRANDE DE LOÍZA
RÍO TURABO
Quebrada Las Bambas
Quebrada Juner
Cuguillas
José Mercado
(Joins sheet 37)


(Joins sheet 28)
GURABO
MAMEY
JACUAR
RINCON
NAVARRO
QUEBRADA
MUNICIPIO DE GURABO
MUNICIPIO DE SAN LORENZO
Subestacion Experimental
(Joins sheet 36)
(Joins sheet 46)

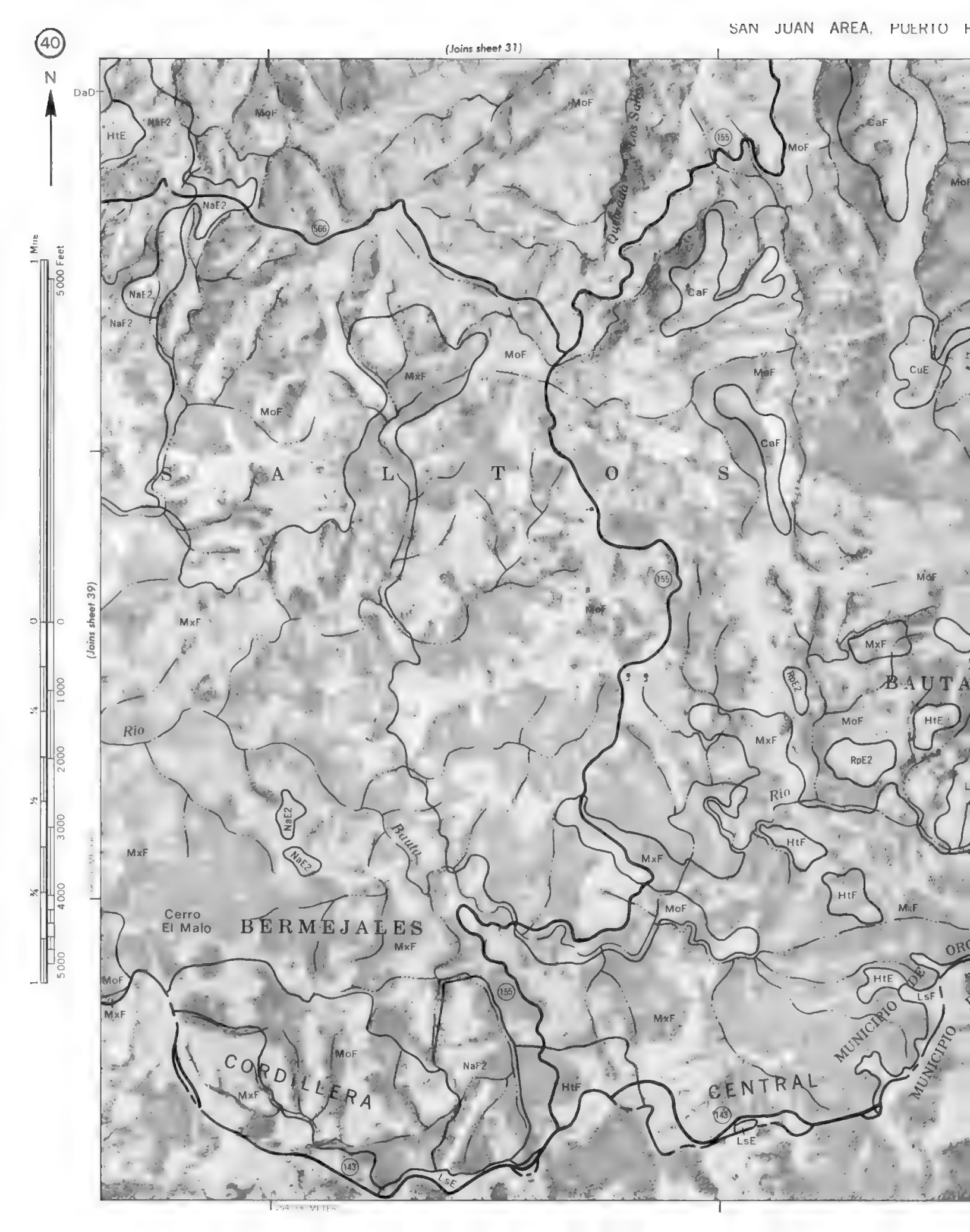

37
N
To
RoB
MaC
Re
MaB
RÍO
Re
To
GURABO
JuC
MaB
To
JuC
MxE
30
MaB
To
CaF
EY
To
MUNICIPIO
MUNICIPIO
To
DE
DE
JUNCOS
GURABO
CaF
MxE
aF
CaF
929
MUNICIPIO DE JUNCOS
PaF
PaE
PaF
Co
PaF
PaE
Uv
MxE
MxD
RoC2
MxD
MxE
(Joins sheet 14)
CUEVAS
Cs
MxE
MxE
MaD
RÍO GRANDE DE LOÍZA
GRAVERO
MxD
CbF
MaC
Cs
MUNICIPIO DE CAROLINA
MUNICIPIO DE TRUJILLO ALTO
MxF
MxF
CbF
MaC
CaF
MxF
CaF
CaF
DOS BOCAS
(Joins sheet 21)
1 Mile
5000 Feet
0
0
1000
¼
2000
½
3000
4000
¾
5000
1


N
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
(Joins lower left)
MUNICIPIO DE CIALES
MUNICIPIO DE OROCOVIS
MUN. DE JAYUYA
ALA DE LA PIEDRA
MUNICIPIO DE JUANA DIAZ
MUNICIPIO DE OROCOVIS
Toro Negro
Lago El Guineo
LsF
MxF
MoF
143
35 000 METERS
142 000 METERS
1000 AND 2000 METER GRID TICKS
38 000 METERS
140 000 METERS
(Joins inset)

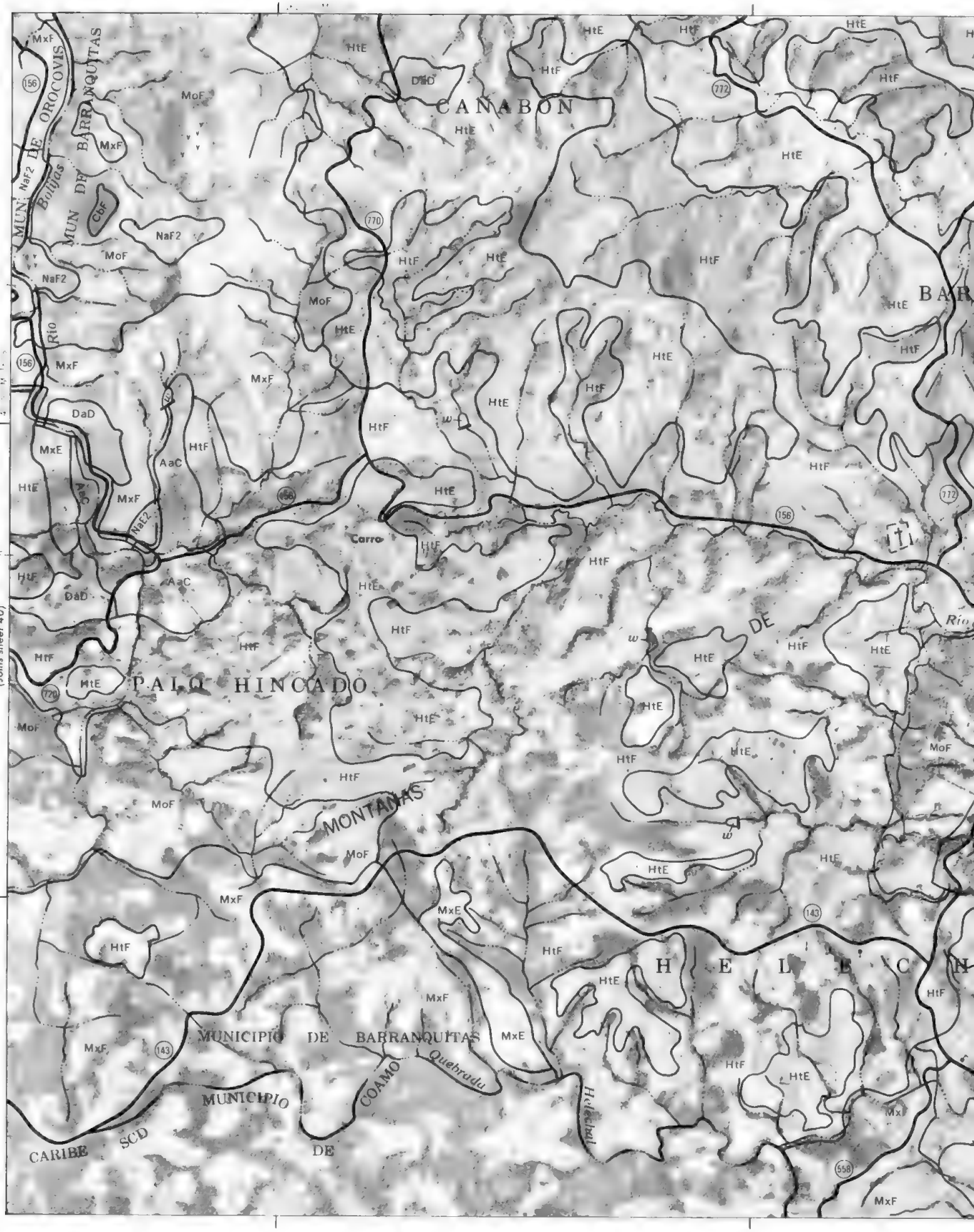

(Joins sheet 29)
(Joins lower right)
144 000 METERS
Dispensario
MoF
LsF
149
143
MUNICIPIO DE VILLALBA
MUNICIPIO DE CIALES
MUNICIPIO DE OROCOVIS
Río Toro Negro
DaD
CACAOS
ALA DE LA PIEDRA
Salto de Doña Juana
Quebrada
Doña Juana
HtE
LsE
PeF
(Joins sheet 39)
(Joins inset)


CACAOS
Lago de Matrullas
CaF
LsF
MoF
LsE
HtF
564
143
Peña La Francia
B A U T A
A B A J O
Río Matrullas
Quebrada Doña Juana
Cerro Doña Juana
ALA DE LA PIEDRA
MUNICIPIO DE OROC
MUNICIPIO DE VILLAL
(Joins sheet 38)


(Joins sheet 30)
39
N
CaF
MoF
CbF
MxF
NaF2
HtE
DbD
MxE
LsF
LsE
PELLEJAS
SALTOS
BERMEJALES
Río Bauta
CENTRAL
CARIBE
SCD
MUNICIPIO DE COAMO
DE VILLALBA
DE OROCOVIS
(Joins sheet 40)
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000


(Joins sheet 31)
(Joins sheet 39)
N
1 Mile
5000 Feet
DaD
HtE
MaF2
MoF
NaE2
566
Quebrada Los Sotos
155
CaF
MxF
CuE
S A L T O S
RpE2
BAUTA
Río
HtF
LsF
LsE
Cerro
El Malo
BERMEJALES
CORDILLERA CENTRAL
MUNICIPIO
143

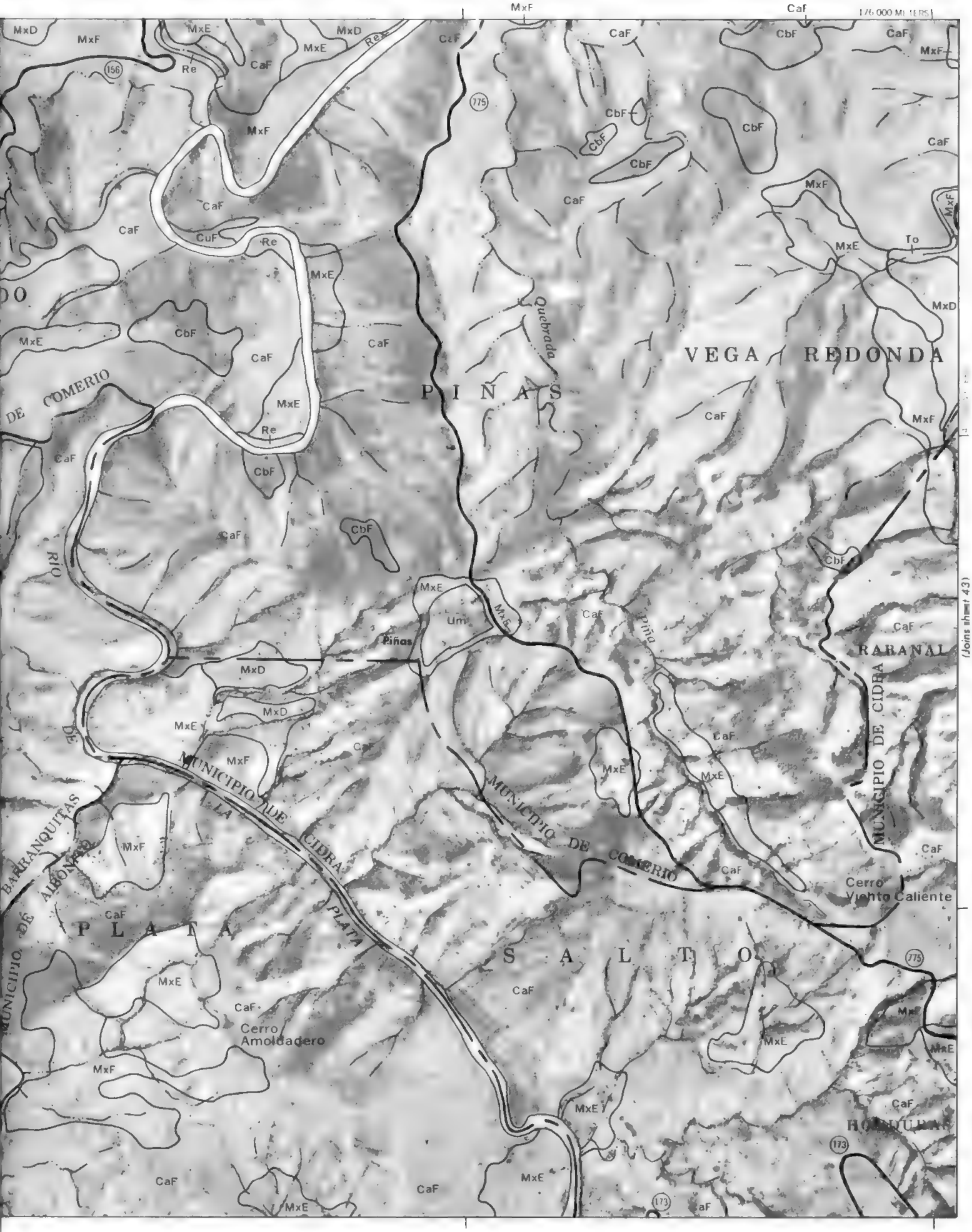

SABANA
BAUTA ARRIBA
PALO HINCADO
BARRANQUITAS
OROCOVIS
COAMO
CORDILLERA CENTRAL
MUNICIPIO DE OROCOVIS
MUNICIPIO DE BARRANQUITAS
MUNICIPIO DE COAMO
Bauta
MoF
HtF
HtE
DaD
LsE
MxF
CuF
CuE
CbF
YeF
RpF2
CaF
NaF2
LsF
569
156
720
143
(Joins sheet 41)


CANABON
PALO HINCADO
MUNICIPIO DE BARRANQUITAS
MUNICIPIO DE COAMO
MONTAÑAS DE HELECHAL
MUN. DE BARRANQUITAS
MUN. DE OROCOVIS
Río Bollas
Río
Carro
Quebrada
CARIBE SCD
(Joins sheet 40)
MxF
HtE
HtF
MoF
NaF2
CbF
DaD
MxE
AaC
NaE2
AaG
156
772
770
143
558


41
N
(Joins sheet 32)
NaF2
BARRANCAS
QUEBRADA GRANDE
GONZÁLEZ
JUAN
Padilla
Quebrada
Grande
La Vega
de Barranquita
Río
BARRANQUITAS
HONDURAS
CANAL
MUNICIPIO DE BARRANQUITAS
MUNICIPIO de Usabón
MUNICIPIO DE AIBONITO
San Cristóbal
LLANOS
Cañón
Río
(Joins sheet 42)
(Joins sheet 47)
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000

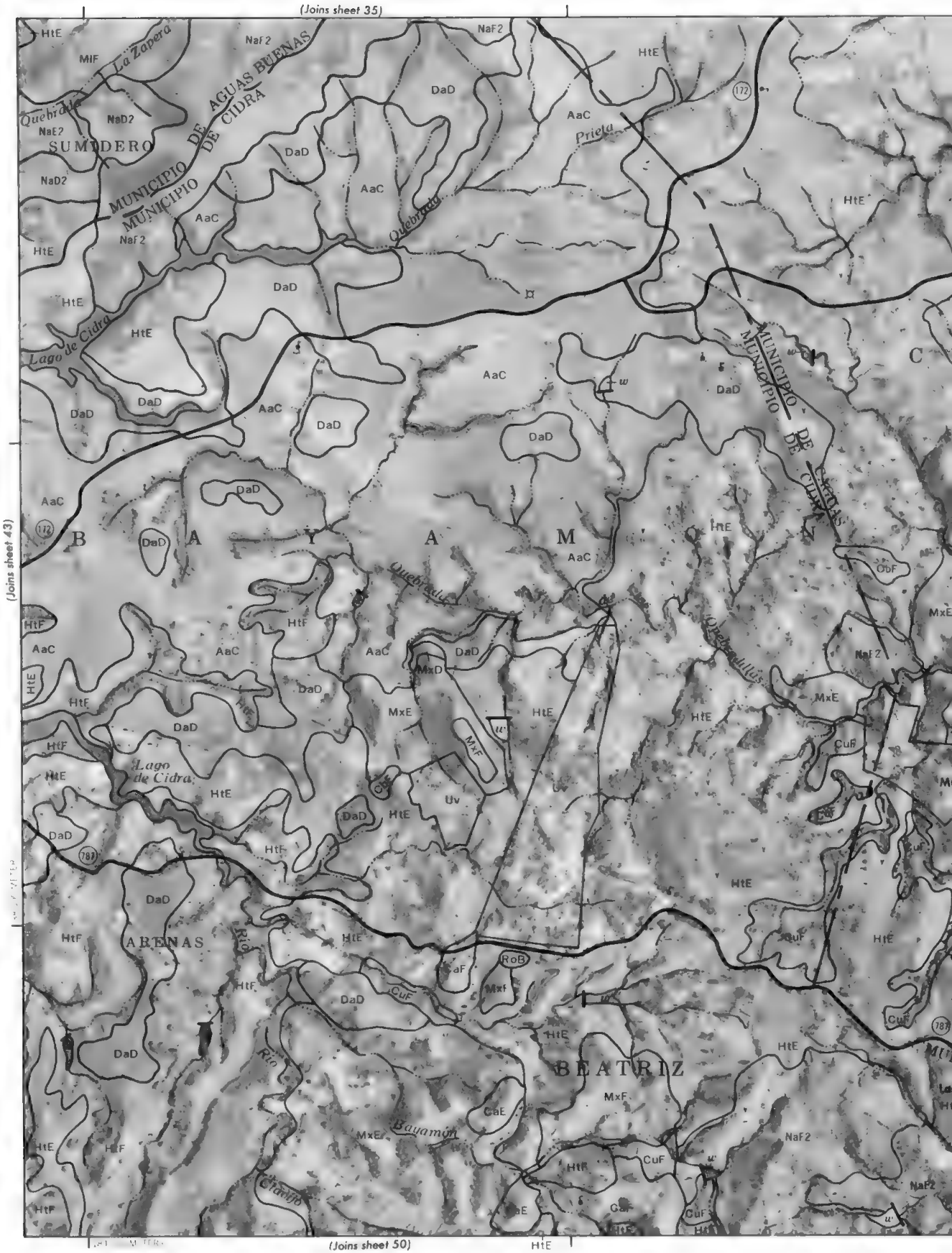

42
N
(Joins sheet 33)
(Joins sheet 41)
(Joins sheet 48)
5000 Feet
0
1000
2000
3000
4000
5000
QUEBRADA GRANDE
RIO HONDO
HONDURAS
LLANOS
CANONILLAS
MUNICIPIO DE BARRANQUITAS
MUNICIPIO DE COMERÍO
MUNICIPIO DE AGUADA
La Guitarra
Prieta
Quebrada
Tigre
Río
Usabón
Um
La Loma
HtE
HtF
MxD
MxE
MxF
NaE2
NaF2
CaF
CbF
CeE
CuF
Es
Re
Ri
Alicia
156
749
726

PUERTO RICO — SHEET NUMBER 42




CEJAS
VEGA REDONDA
COMERIO
CIDRA
MUNICIPIO DE
MUNICIPIO DE
CEIBA
RÍO ABAJO
RABANA
SALTO
Cerro Almirante
Rio
Quebrada
Catalina
Arroyata
Banco
(Joins sheet 42)
MaC
CaF
MxF
MxE
MxD
HuF
HtE
CaE
CbF
JuC
To
TaF
791
172
782
173
175

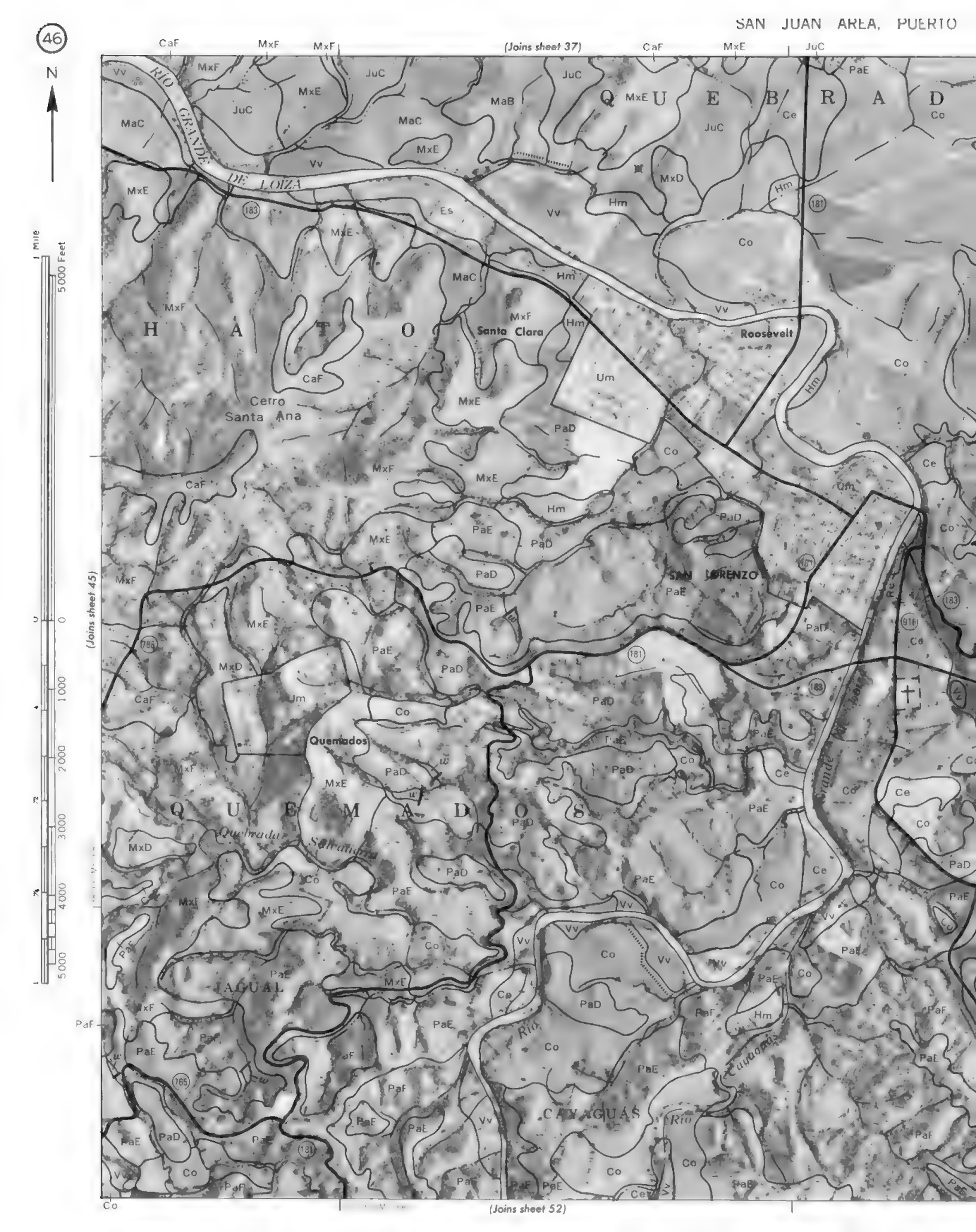

(Joins sheet 34)
MONTE LLANO
Solano
Quebrada
MUNICIPIO DE CIDRA
Río Bayamón
MUNICIPIO DE AGUAS BUENAS
Río de
Cidra
BAYAMÓN
Río de
Layo
CIDRA
Rodriguez Hevia
Planta de Tratamiento de Aguas Negras
Río Sana Clara
Sabana
ARENAS
(Joins sheet 44)
(Joins sheet 49)
1 Mile
5000 Feet

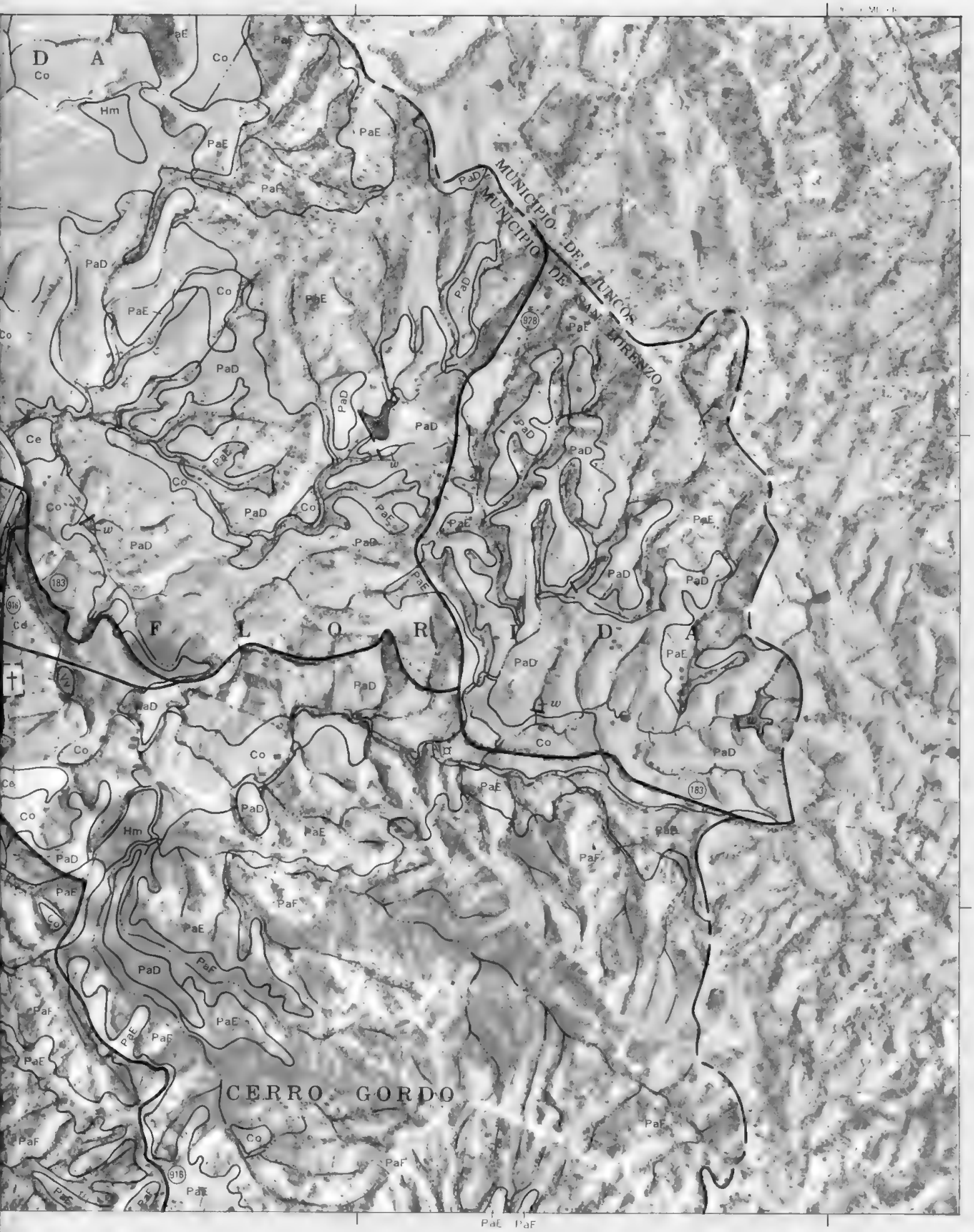

(Joins sheet 35)
(Joins sheet 43)
(Joins sheet 50)
N
5000 Feet
0
1000
2000
3000
4000
5000
MUNICIPIO DE AGUAS BUENAS
MUNICIPIO DE CIDRA
MUNICIPIO DE CIDRA
SUMIDERO
BARRIO ARENAS
BARRIO BEATRIZ
Lago de Cidra
Lago de Cidra
Quebrada
Quebrada
Quebrada
Quebrada
Quebrada
Quebrada
Prieta
La Zapera
Río
Río
Río
Bayamón
Caguas
HtE
HtF
AaC
DaD
NaF2
NaD2
NaE2
MxE
MxD
MxF
CuF
CaE
CaF
RoB
Uv
ObF
MlF
172
787

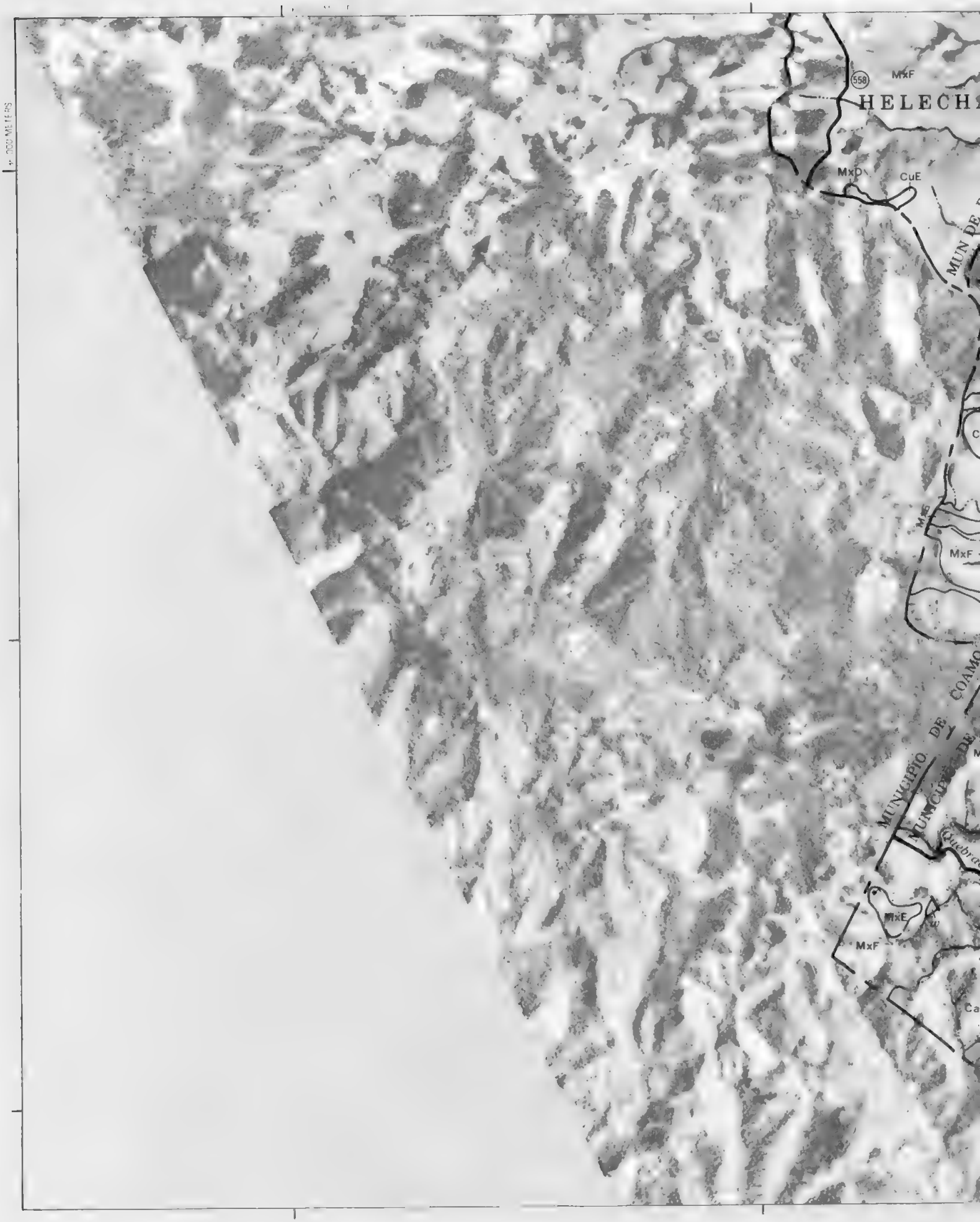

CANABONCITO
TURABO
BEATRIZ
Quebrada de las Quebraditas
Quebrada
La Jurado
Muñoz Grillo
MUNICIPIO DE CIDRA
MUNICIPIO DE CAGUAS
Las Cruces
CARRETERA EN CONSTRUCCIÓN
(Joins sheet 45)
HtE
HtF
NaF2
NaE2
MxE
MxF
CaF
CuF
CbF
RoC2
NaL2
HuF
LsF
AsC


Esperanza
Río Culebrinas
Quebradillas
Quebrada de los
Quebrada
Beatriz
Planta Purificación
Tanque de Agua
La Pradera
Quebrada Sonadora
Quebrada Naranjito
Villa Borinquen
TUBABO
BORINQUEN
(Joins sheet 44)

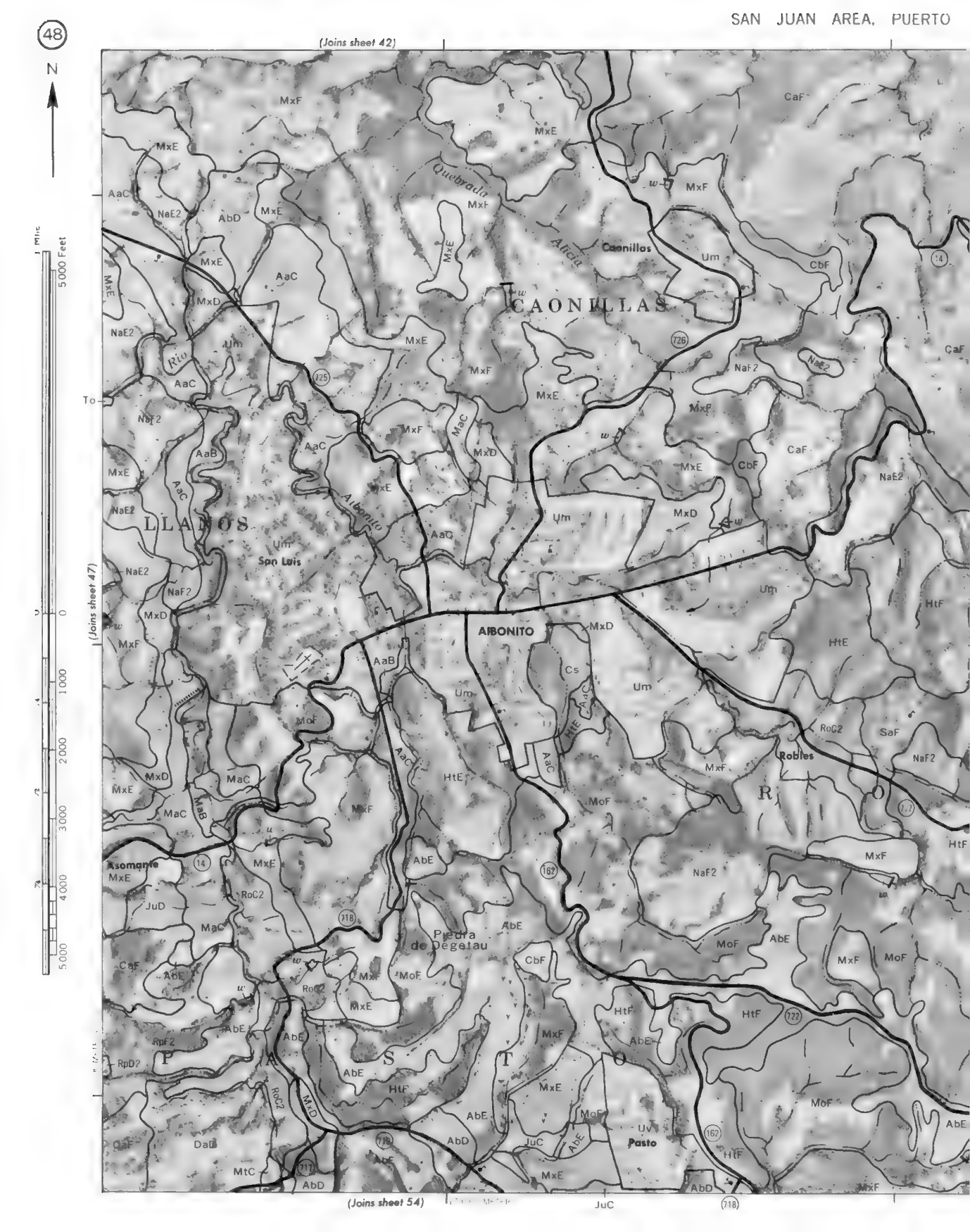

45
N
(Joins sheet 36)
(Joins sheet 46)
(Joins sheet 51)
TOMÁS DE CASTRO
HATO
QUEMADOS
JAGUAL
MUNICIPIO DE AGUAS SAN LORENZO
Tomás de Castro
El Naranjito
El Cinco
Quebrada Las Bambúas
Quebrada Janer
Quebrada El Canglé
Quebrada Saladierra
Río Grande de Loíza
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000

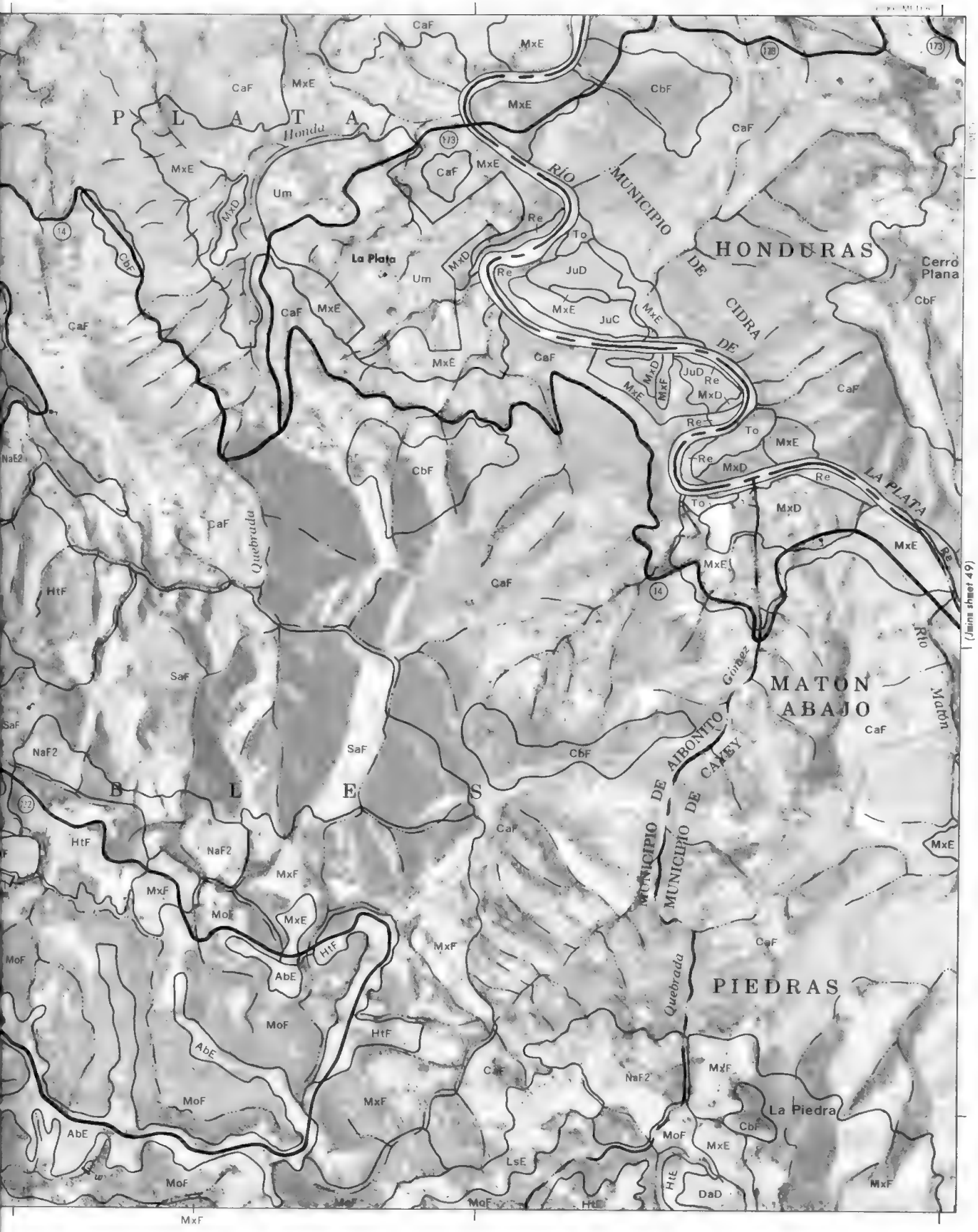

N
1 Mile
5000 Feet
(Joins sheet 37)
(Joins sheet 45)
(Joins sheet 52)
RIO GRANDE DE LOIZA
HATO
Santa Clara
Roosevelt
Cerro Santa Ana
SAN LORENZO
Quemados
QUEBRADOS
Quebrada Salvatierra
JAGUAL
CAYAGUAS
Río Cayaguas
Río Grande de Loíza
CaF
MxF
MxE
MxD
JuC
MaB
MaC
Vv
Es
Hm
Um
PaD
PaE
PaF
Co
Ce
183
181
916
785
765


MUNICIPIO DE JUNCOS
MUNICIPIO DE SAN LORENZO
FLORIDA
CERRO GORDO
PaE
PaF
PaD
Co
Hm
Ce
Cd
978
183
918


MxF
HELECHA
MxD
CuE
MUN DE
MxF
MUNICIPIO DE COAMO
MUNICIPIO DE
Quebrada
MxE
MxF
Ca


47
N
(Joins sheet 41)
(Joins sheet 48)
(Joins sheet 53)
1 Mile
5000 Feet
ELECHAL
Holechal
MUN DE BARRANQUITAS
MUN DE AIBONITO
MUNICIPIO DE COAMO
MUNICIPIO DE AIBONITO
Río Aibonito
Quebrada
Aguas
LLANOS
COAMO
PASTO
MxE
MxD
MxF
HtE
HtF
DaD
NaF2
NaE2
CaF
CbF
CuE
MaC
MaB
AaB
AaC
AbE
RoB
RoC2
LaC2
CaE
RpD2
DeF

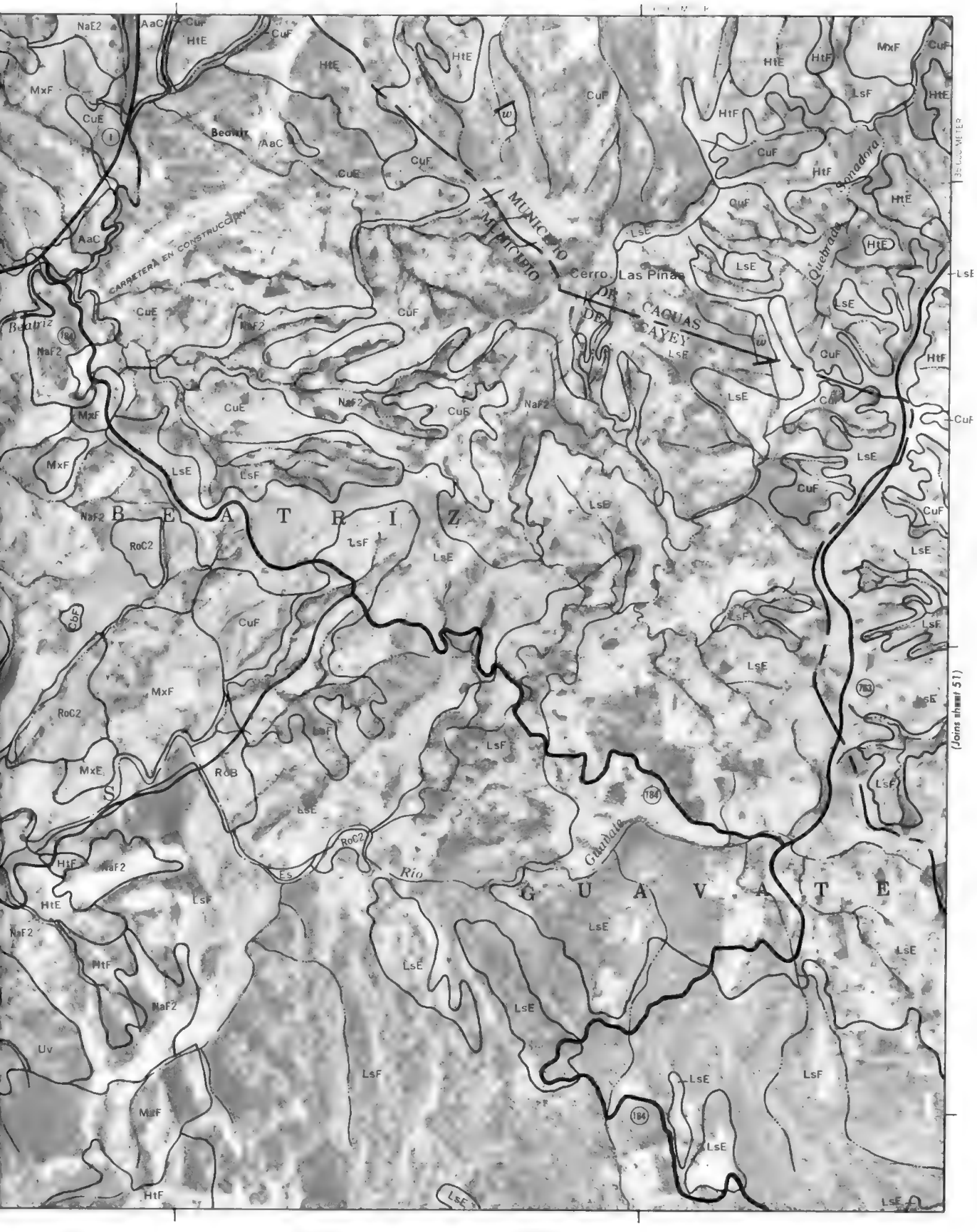

(Joins sheet 42)
N
Quebrada
Aicá
Caonillas
CAONILLAS
Río
Aibonito
AIBONITO
LLANOS
San Luis
Piedra de Degetau
Asomante
Robles
Pasto
(Joins sheet 47)
(Joins sheet 54)
5000 Feet
0
1000
2000
3000
4000
5000


PLATA
Honda
La Plata
RÍO
MUNICIPIO DE CIDRA
HONDURAS
Cerro Plana
LA PLATA
Quebrada
MATON ABAJO
Río Matón
González
MUNICIPIO DE AIBONITO
MUNICIPIO DE CAYEY
BLES
PIEDRAS
Quebrada
La Piedra
(Joins sheet 49)
CaF
MxE
CbF
MxD
Um
Re
To
JuD
JuC
MxF
NaF2
HtF
SaF
MoF
AbE
LsE
DaD

HONDURAS
Cerro Gordo
Quebrada
Galindo
Bocana
Cuña
TOÍTA
RÍO DE LA PLATA
Honduras
Toíta
MUNICIPIO DE CIDRA
MUNICIPIO DE CAYEY
MATÓN ABAJO
Río Matón
La Placita
CAYEY
173
14
CaF
MxE
MxD
JuC
CaE
CbF
MxF
Um
Re
Es
MaC
MxB

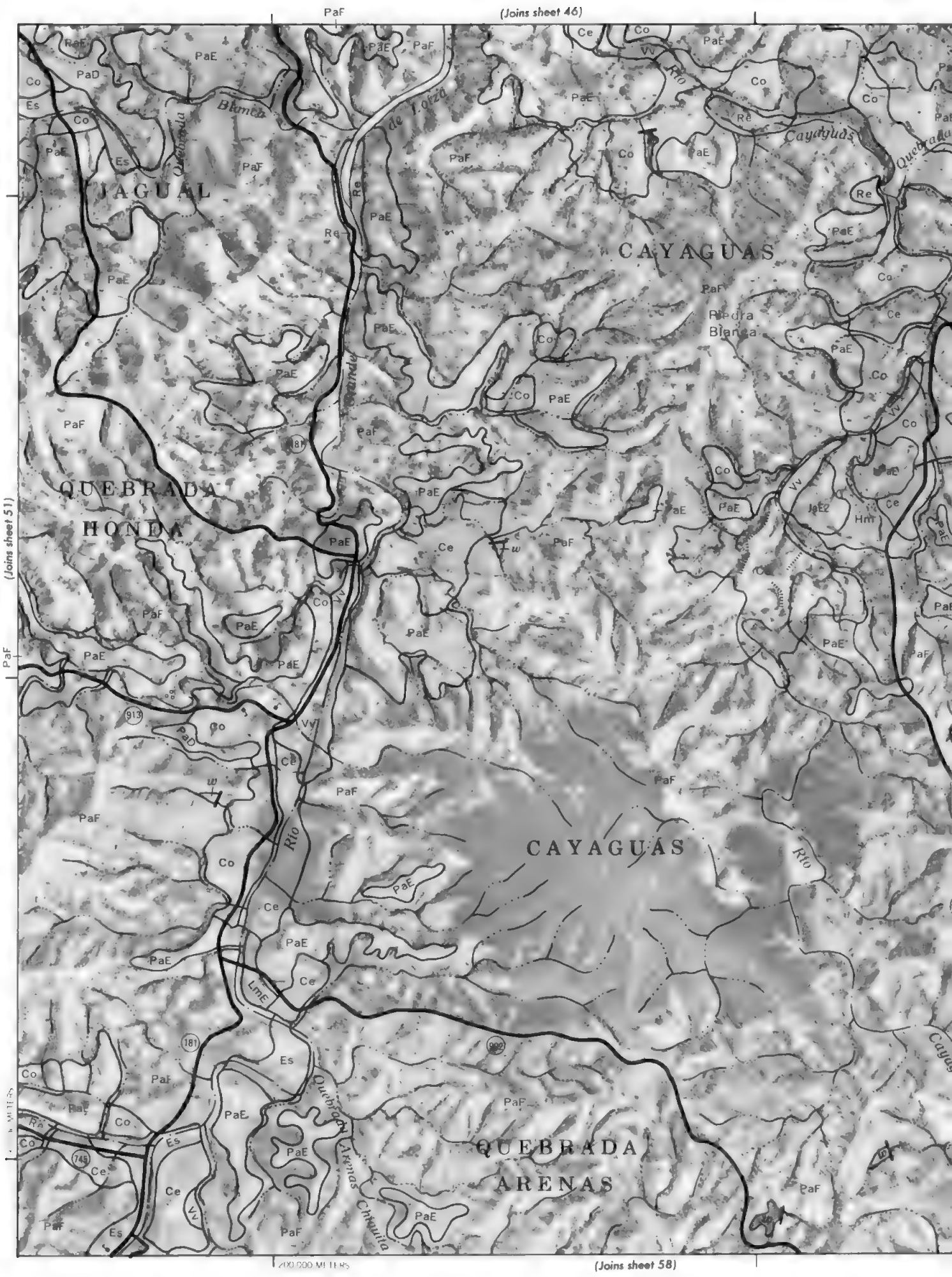

49
N
(Joins sheet 43)
(Joins sheet 50)
(Joins sheet 55)
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
¼
½
¾
1
ARENAS
RIO DE LA PLATA
Nogueras
Quebrada Zanja
Quebrada
Quebrada Marilla
Cerro La Guásima
Colegio Universitario
PUEBLO NORTE
CAYEY
MxF
MxE
MxD
MxB
HtE
HtF
MaC
MaB
CaF
CaE
JuC
JuD
VkC2
RoC2
To
Um
171
173
734
735
14
1


50
N
5000 Feet
5000 METERS
(Joins sheet 44)
(Joins sheet 49)
(Joins sheet 56)
BEATRIZ
MUNICIPIO DE CAYEY
MUNICIPIO DE CIDRA
VEGA
MONTE LLANO
RIO
Clavijo
Quebrada Beatriz
Quebrada
Cuevas
DE LA PLATA
Vegas
HtF
HtE
MxE
MxF
CaF
NaF2
NaE2
RoC2
RoB
MaB
MaC
MxD
AaC
SaF
DaD
CbF
To
Uv
734
735
738
742
743
52
1
184

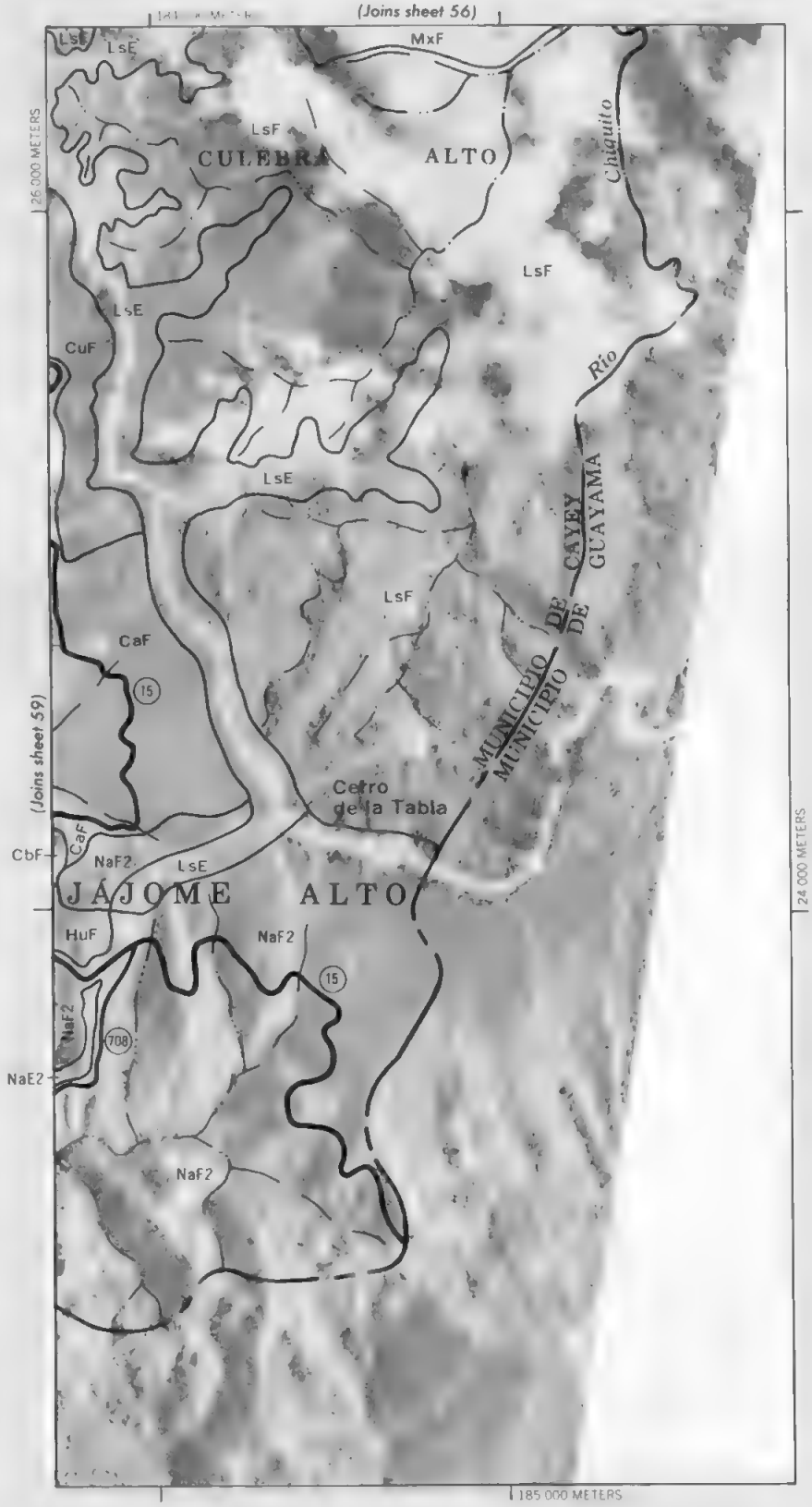

BEATRIZ
GUAVATE
Beatriz
Río Guabate
Quebrada Sonadora
Cerro Las Piñas
MUNICIPIO DE CAGUAS
MUNICIPIO DE AGUAYEY
CARRETERA EN CONSTRUCCION
(Joins sheet 51)
NaE2
AaC
CuF
HtE
MxF
CuE
NaF2
LsE
LsF
RoC2
RoB
MxE
HtF
Uv
CbF
Es
184


BORINQUEN
SAN SALVADOR
SAN SALVADOR
MUNICIPIO DE
MUNICIPIO DE
La Plaza
Quebrada
Morena
Turabo
763
765
HtF
HtE
HuF
HaF
LsE
CaF
NaF2
CbE
CbF
AaC
MxF
MxE
CuF
LmF
LoF2
PaF
LsF
Cerro Lucero
(Joins sheet 50)


51
N
(Joins sheet 45)
MxD
MxD
MxD
1988
MxE
MxF
PaD
Jagual
NaF2
HtE
MxF
MxE
Um
Co
765
Quebrada
Ce
MxF
MxE
UuC
Es
HuF
Piedra
Reinada
HtF
HtE
Blanca
PaF
HtF
CbF
PaE
Co
JAGUAL
Quebrada
NaF2
HtE
CaF
Es
PaE
MxF
Co
Cerro
Gregorio
PaF
HtF
MxF
PaF
PaF
LoF2
QUEBRADA
HONDA
PaE
(Joins sheet 52)
PaF
Quebrada
913
Honda
DE CAGUAS
ICIPIO
PIO DE SAN LORENZO
PaF
E
S
P
I
N
O
LoF2
Ce
LmF
745
Ce
Re
PaF
LoF2
LoF2
PaE
Co
Re
Re
LmF
Ce
Co
Río
Co
PaF
PaF
LoF2
LoF2
(Joins sheet 57)
1 Mile
5000 Feet
0
0
¼
1000
2000
½
3000
¾
4000
5000
1
5000


N
1 Mile
1000 Feet
(Joins sheet 46)
(Joins sheet 51)
(Joins sheet 58)
JAGUAL
CAYAGUAS
QUEBRADA HONDA
CAYAGUAS
QUEBRADA ARENAS
Quebrada Blanca
Río de Loíza
Piedra Blanca
Río
Río
Quebrada Arenas
Chiquita
PaF
PaE
Co
Ce
Es
PaD
Re
Vv
LmE
Hm
181
913
745
9902

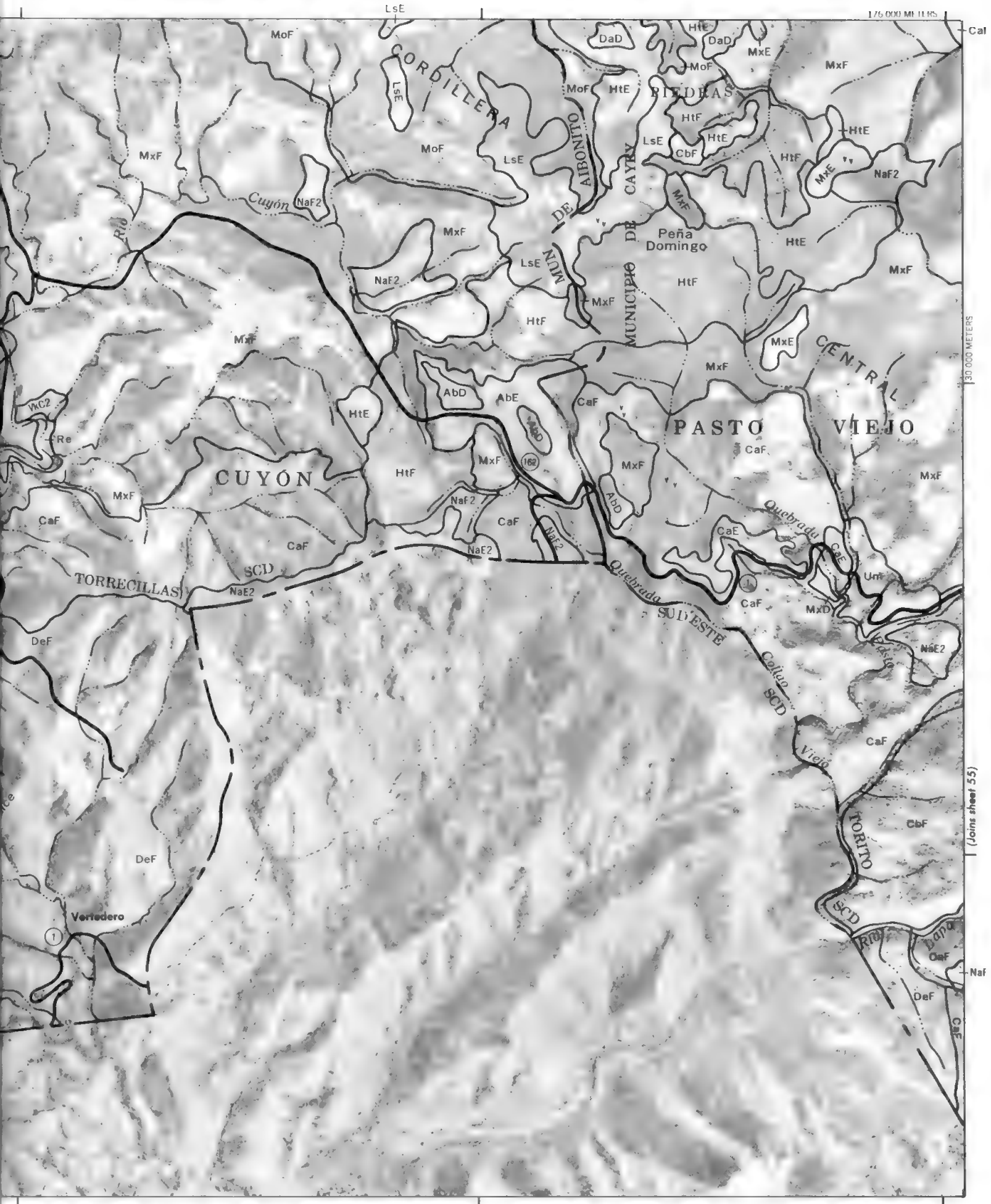

CERRO GORDO
QUEBRADA ARENAS
MUNICIPIO DE JUNCOS
MUNICIPIO DE SAN LORENZO
MUNICIPIO DE LAS PIEDRAS
MUNICIPIO DE YABUCOA
Cerro Viviana
Quebrada Grande
Cayaguas
PaF
PaE
PaD
Co
Ce
LoF2
916
912

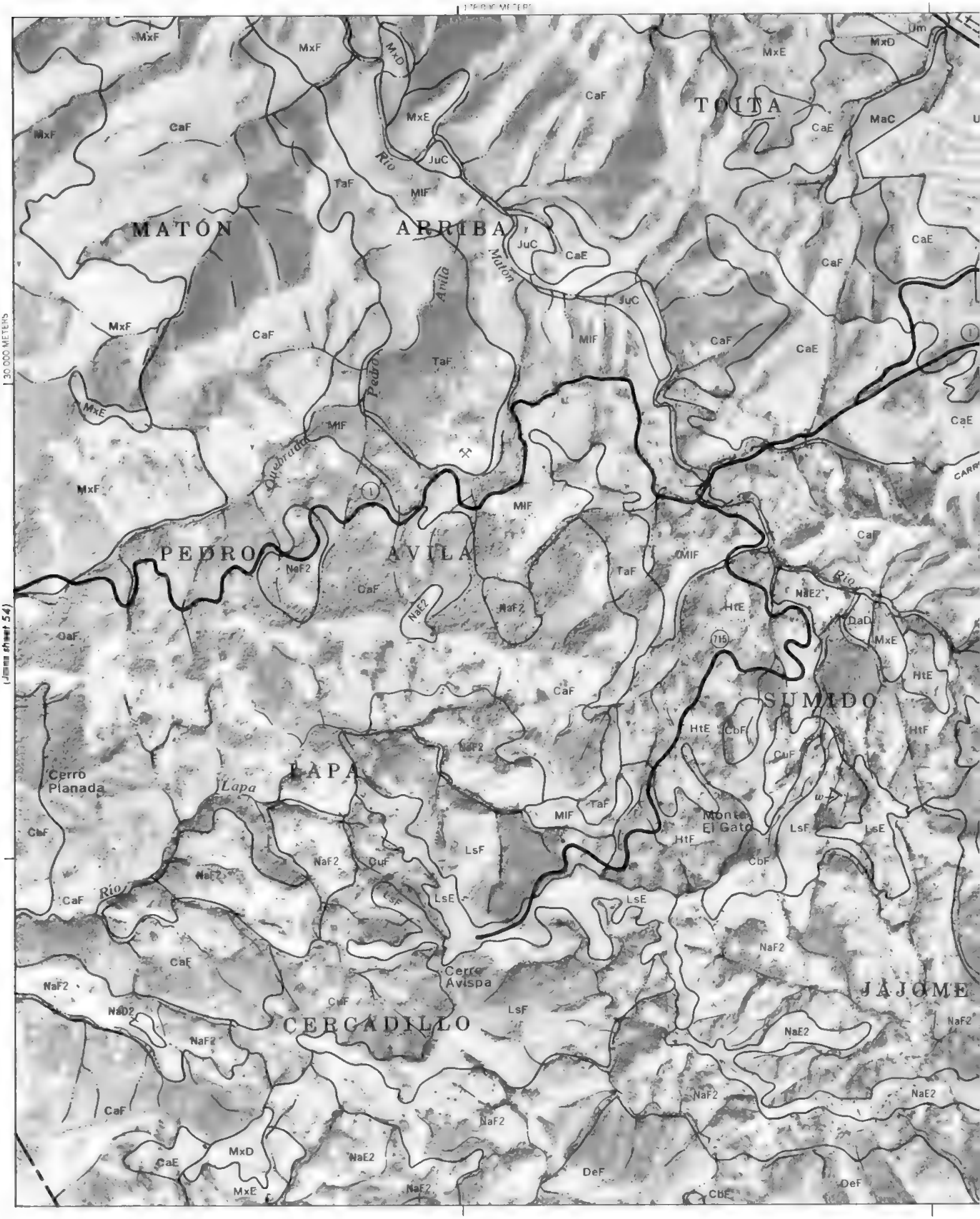


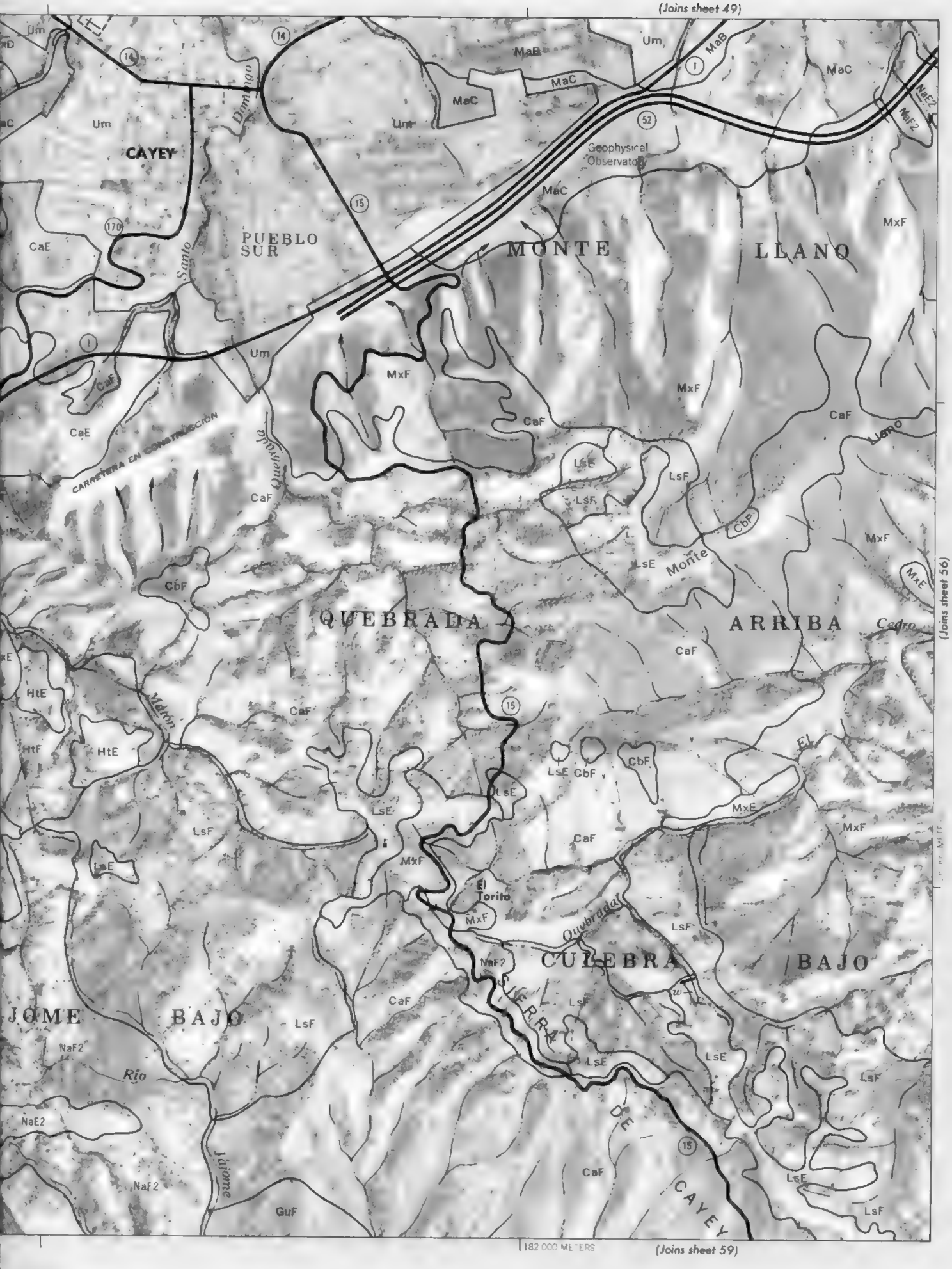
1000 AND 2000 METER GRID TICKS


53
MxE
MxE
CaF
(Joins sheet 47)
RpD2
N
MxE
CaF
CbF
DeF
CbF
PASTO
ASOMANTE
CORDILLERA
CaF
CENTRAL
14
111
Quebrada
MUNICIPIO DE AIBONITO
MUNICIPIO DE COAMO
DeF
ALGARROBO
(Joins sheet 54)
Obispo
CaF
1 Mile
5000 Feet
0
0
1000
2000
3000
4000
5000
168 000 METERS

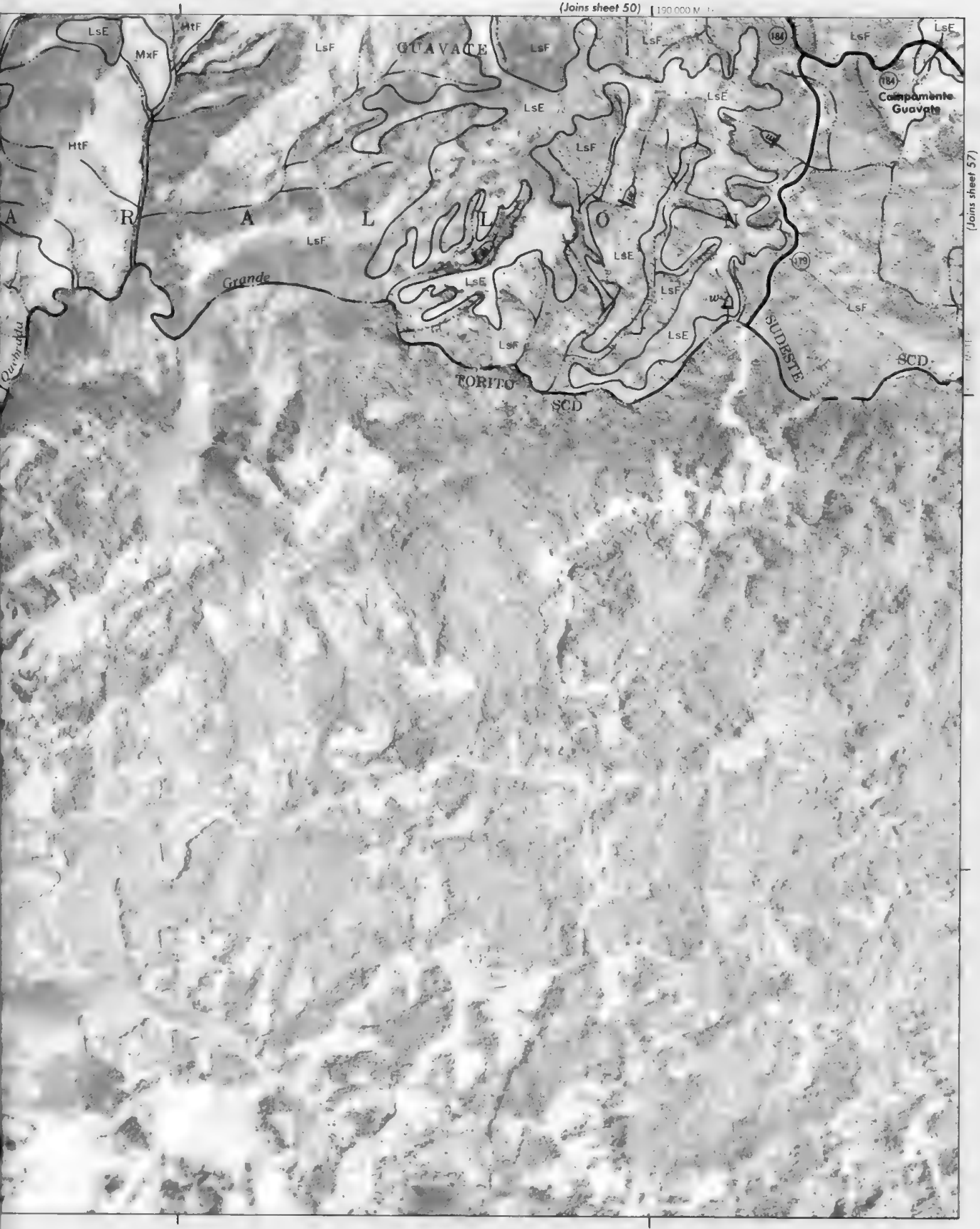
SAN JUAN AREA, PUERTO

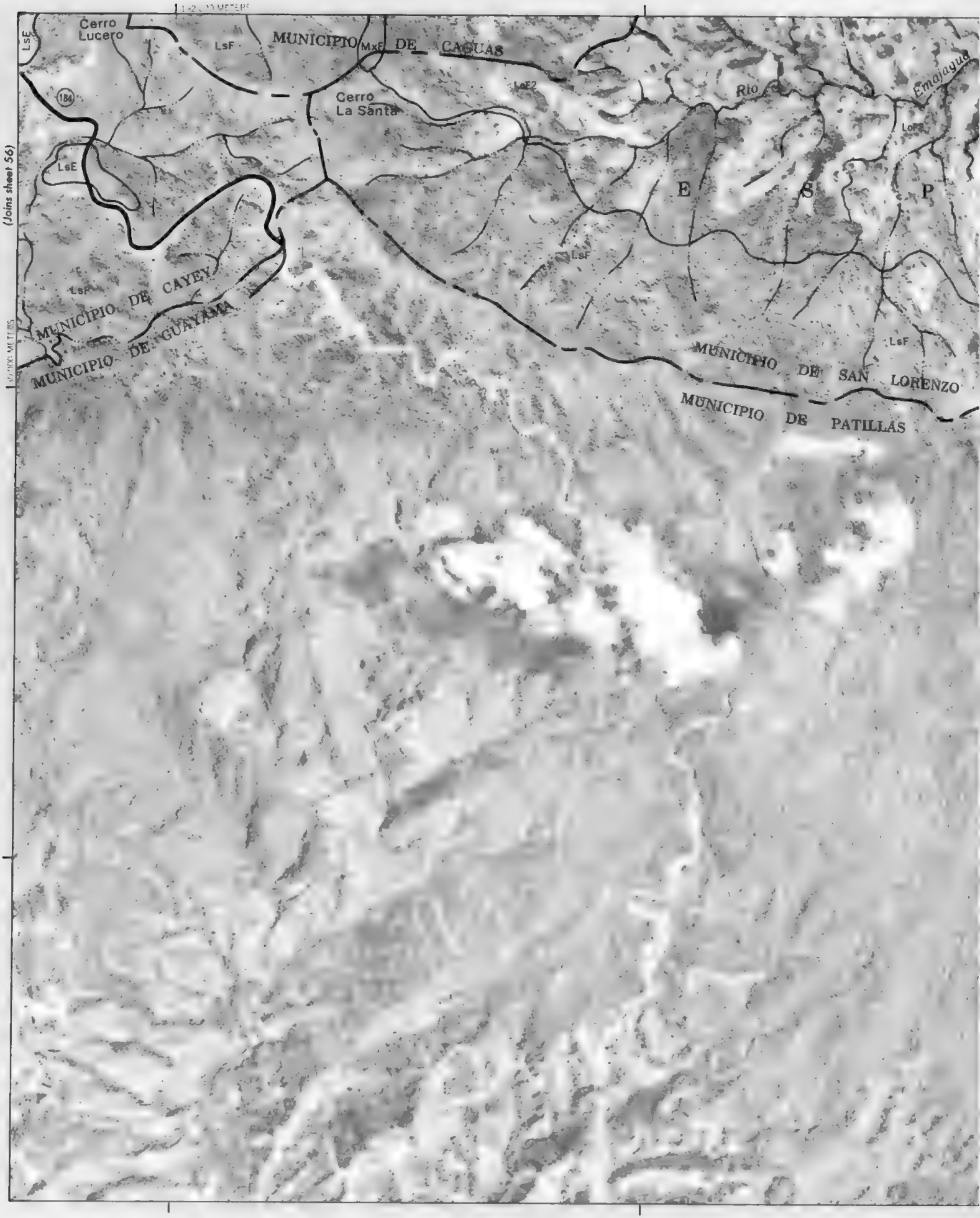

176 000 METERS
30 000 METERS
CORDILLERA CENTRAL
PASTO VIEJO
CUYÓN
TORRECILLAS
PIEDRAS
Peña Domingo
Quebrada SUDESTE
Quebrada
Río Cuyón
Río Viejo
Río Bayamón
TORITO
MUNICIPIO DE AIBONITO
MUNICIPIO DE CAYEY
Vertedero
(Joins sheet 55)
LsE
MoF
DaD
HtE
MxE
MxF
HtF
CbF
NaF2
AbD
AbE
CaF
CaE
MxD
DeF
NaE2
VkC2
SCD
162

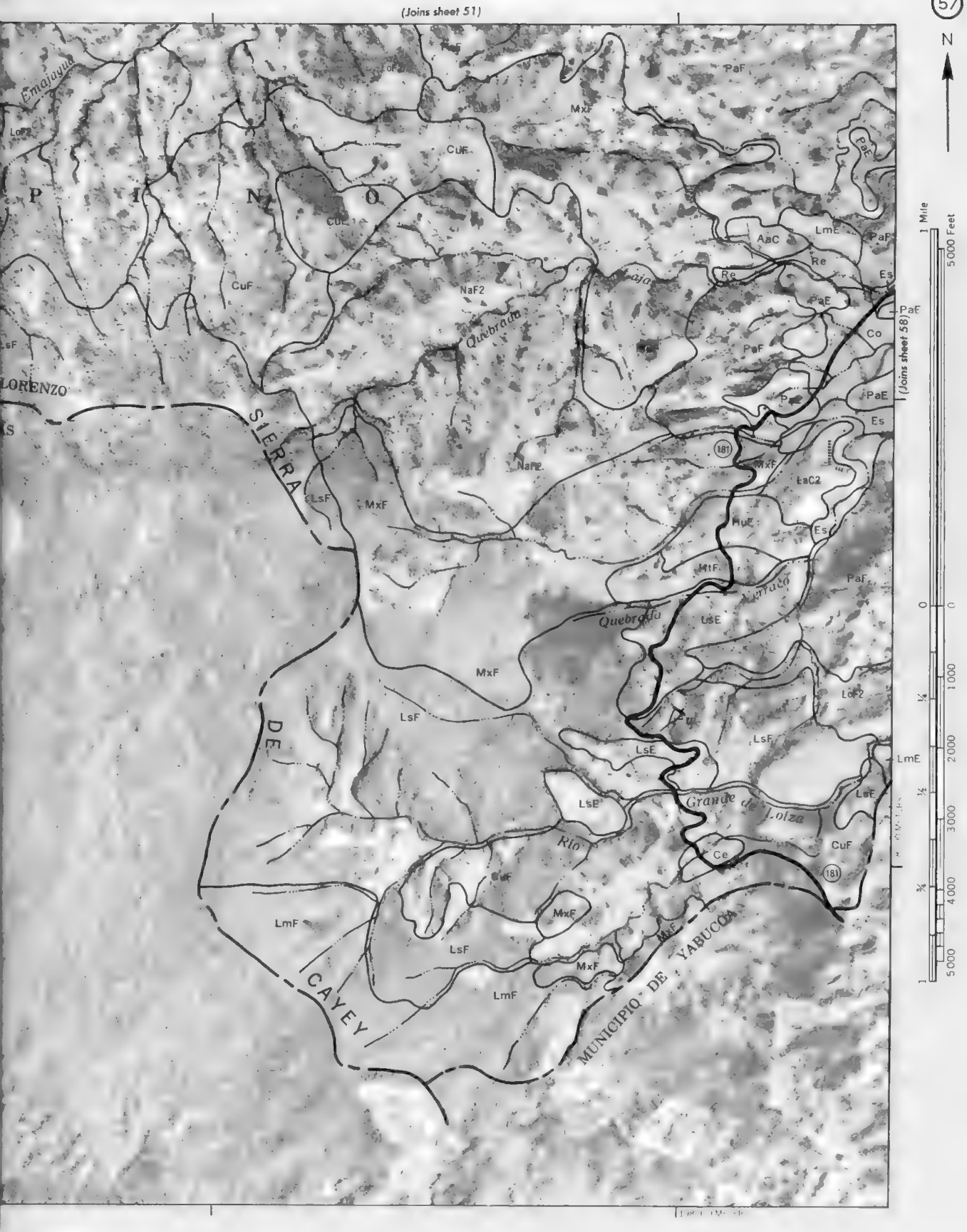

MATON ARRIBA
TOITA
PEDRO AVILA
LAPA
SUMIDO
CERCADILLO
JAJOME
Río Matón
Río Pedro Avila
Quebrada
Río Lapa
Río
Cerro Planada
Cerro Avispa
Monte El Gato
MxF
MxE
MxD
CaF
CaE
MaC
JuC
TaF
MIF
NaF2
NaE2
HtE
HtF
CbF
CuF
LsF
LsE
DaD
DeF
CbE
715
(Jana sheet 54)
30 000 METERS

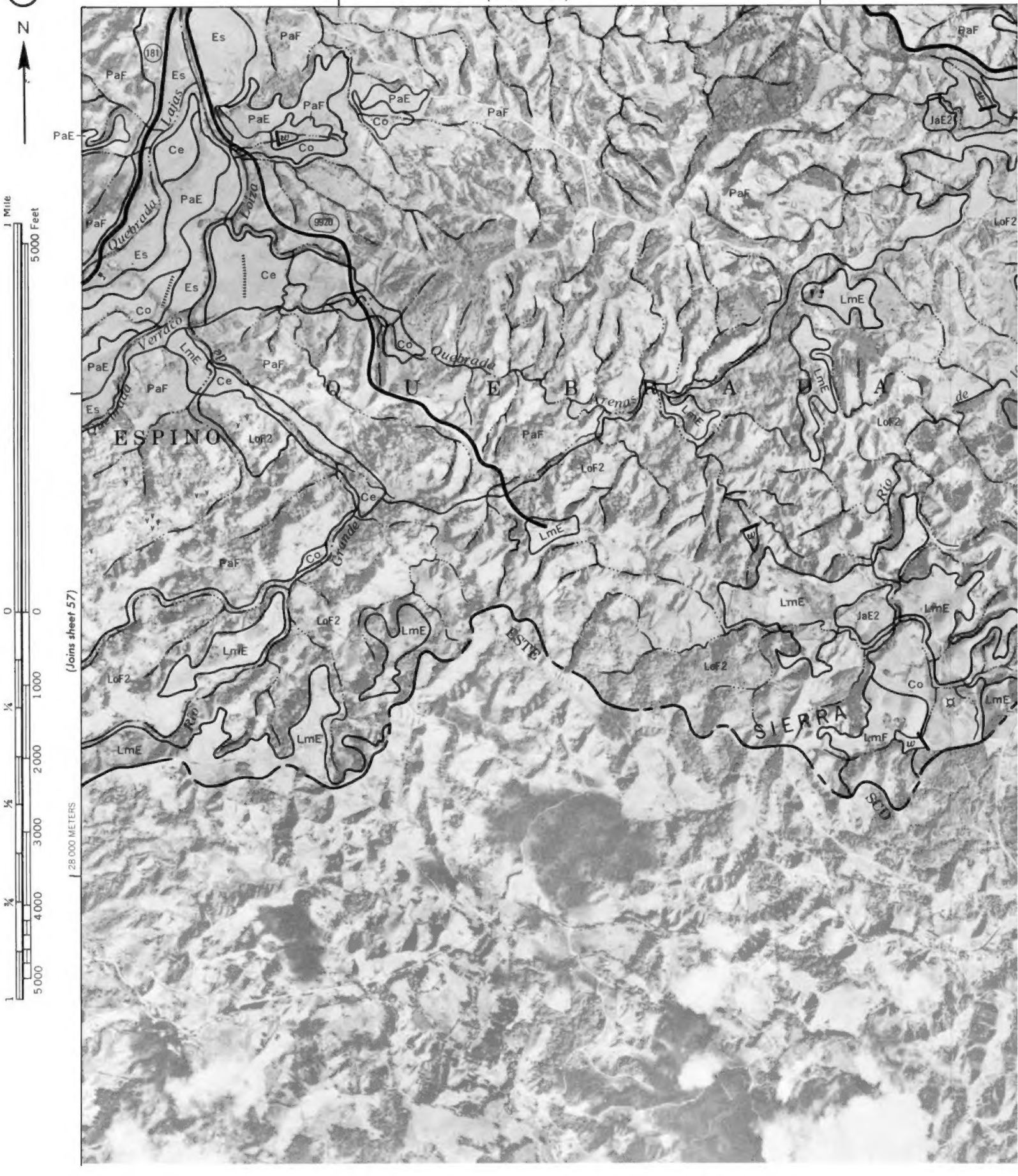

(Joins sheet 49)
55
N
CAYEY
PUEBLO SUR
MONTE LLANO
QUEBRADA ARRIBA
JOME BAJO
CULEBRA BAJO
Geophysical Observatory
CARRETERA EN CONSTRUCCION
Santo Domingo
Quebrada
Monte
Cedro
Melron
El Torito
Quebradal
Río Jájome
SIERRA DE CAYEY
Um
MaB
MaC
MxF
CaF
CaE
LsE
LsF
CbF
HtE
HtF
NaF2
NaE2
GuF
(Joins sheet 56)
(Joins sheet 59)
182 000 METERS
1 Mile
5000 Feet


N
MONTE LLANO
Llano
Monte
CEDRO
PLATA
Quebrada de la
Quebrada
MUNICIPIO DE CAYEY
MUNICIPIO DE GUAYAMA
RÍO
CULEBRA BAJO
CULEBRA ALTO
Culebra
SOBRESTE
MaC
MxF
NaF2
MtC
DaD
HtE
CaF
MxE
LaC2
NaD2
CbF
RoC2
LsF
738
742
(Joins sheet 55)
(Joins inset) sheet 53)
5000 Feet
1000
2000
3000
4000
5000


(Joins sheet 50)
190 000 M
LsE
HtF
MxF
LsF
GUAVATE
184
Campamento Guavate
(Joins sheet 57)
A R A L L O N
Grande
Quebrada
TORITO
SCD
SUDESTE
179

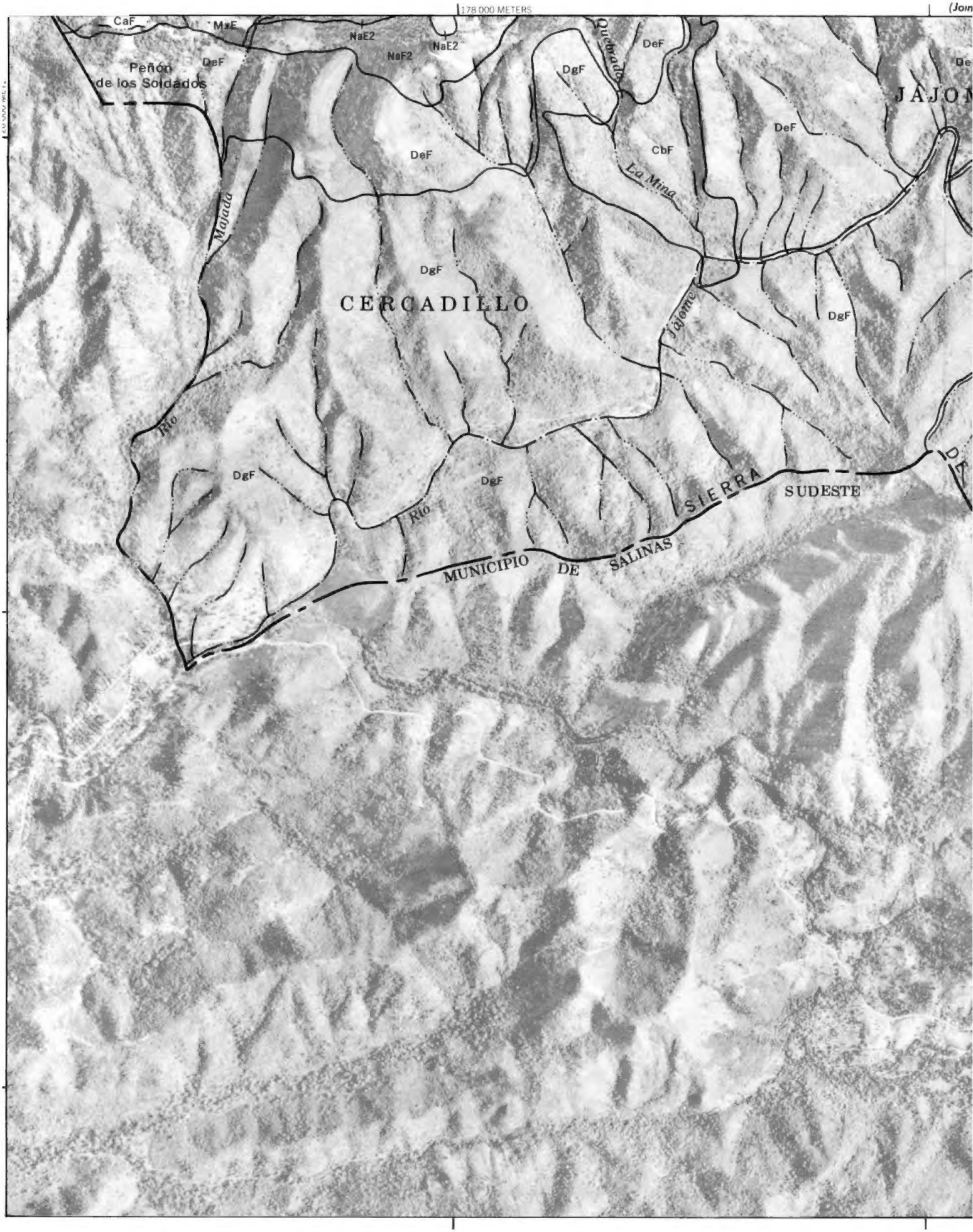

Cerro Lucero
LsE
LsF
MUNICIPIO DE CAGUAS
MxE
LsE2
Cerro La Santa
184
Río
Emajagua
LoE
LsE
E
S
P
LsF
MUNICIPIO DE CAYEY
LsF
MUNICIPIO DE GUAYAMA
LsF
MUNICIPIO DE SAN LORENZO
MUNICIPIO DE PATILLAS
(Joins sheet 56)

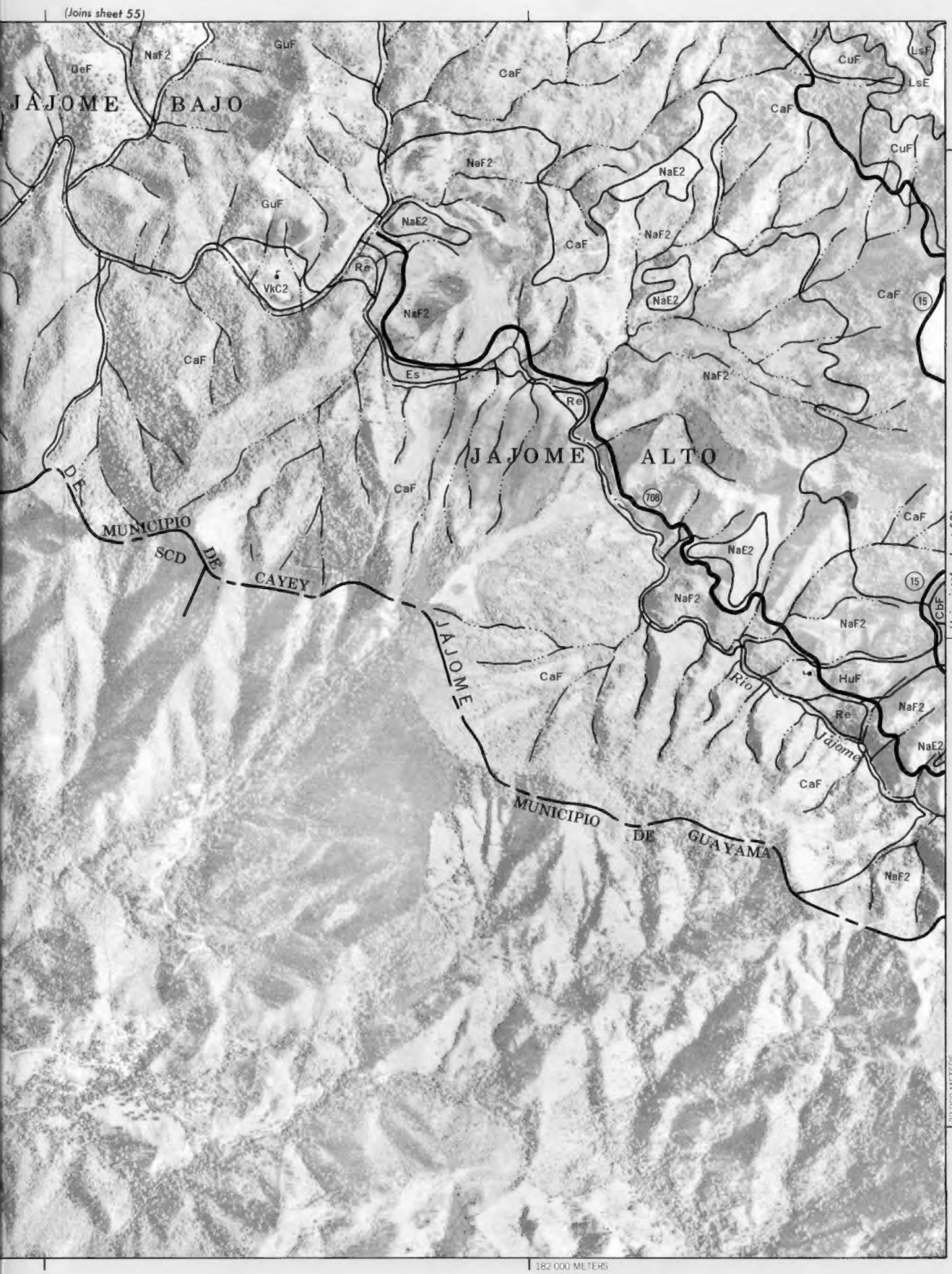

(Joins sheet 51)
57
N
Emajayua
LoF2
P I N O
CuF
MxF
PaF
PaE
AaC
LmE
Re
Es
Co
NaF2
Quebrada
Baja
(Joins sheet 58)
LORENZO
SIERRA
LsF
MxF
181
MtF
LaC2
HuE
LsE
Grande de Loiza
Rio
CuF
Ce
LmF
DE CAYEY
MUNICIPIO DE YABUCOA
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000


(Joins sheet 52)
N
1 Mile
5000 Feet
28,000 METERS
(Joins sheet 57)
ESPINO
QUEBRADA
SIERRA
ESTE
Río
Grande
Quebrada
Verrado
Loiza
Lajas
Co
Ce
Es
PaF
PaE
LmE
LoF2
JaE2
181
9920


206 000 METERS
30 000 METERS
PaF
LoF2
Río
JaE2
902
Aguaguas
Ce
LmE
Vegas
las
de
ARENAS
CALVE
DE
MUNICIPIO
DE
SAN LORENZO
YABUCOA

SAN JUAN AREA, PUERTO RICO





N

1 Mile
5000 Feet
0
1000
2000
3000
4000
5000